3 Biochemistry and Biotechnology

Section-I

Introduction to Chapter

Contents:

- Metabolism, Its Definition and Explanation.
- Food Ingredients, Their Chemical Basis and Digestion.
- Enzymes, Their Uses, Mode of Action and Limitations.
- Human Blood and Its Composition.
- Genetic Basis of Life.
- Use of Genetic Engineering N Agriculture.
- Increase in The Yields of Crops By High Yielding Varieties And Chemical Development.
- Antibodies, Their Discovery and Use.
- Vaccines, Their Discovery and Use.
- Recycling, Its Forms and Importance.
- Different Wastes and Their Scope in Recycling.

Concepts:

1. Why biotechnology is getting so much importance in this century?

Ans. Man has always tried to exploit the nature to its maximum. The new discoveries in biological sciences have provided so much knowledge to man that he is now able to do manipulations in the living things including microbes, animals and plants. Due to his everyday increasing demand man is now developing new and modern techniques of using the natural resources. An example in this regard is the production of insulin with the help of bacteria. Similarly development of thousands of nursery plants of exactly similar genetic makeup from the living tissues obtained from only one plant by the use of tissue culture techniques. Also one seed can be used for the propagation of many plants.

In case of defence, biotechnology is now a days being used for the development of microbial weapons. These weapons are very much dangerous and cause mass killing of humans.

Application of biotechnology for the control of animal, plant and human diseases is getting much importance. One of the properties of this technology is that it does not leave any environmental hazards as in case of pesticide use for the control of diseases and insects. So biotechnology is the need of man for his quest of utilizing the living natural resources by least disturbance of natural cycles.

2. What is the idea behind genetic engineering?

Ans. All the characters like skin colour, hair colour, height, intelligence and shape of body structure in human beings is controlled by genes. Similarly all the characters of plants like production, number of tillers, number of flowers, number of fruit and quality of fruit etc. are genetically controlled. Now man has developed some techniques through which he can change these genes by removing undesired genes or introducing desirable genes. By this gene manipulation he becomes able to induce the required characters in the organism. In other words genetic engineering can result in

such a plant that would produce more than one fruit or vegetable.

Recently research work in genetic engineering and breeding is mostly concentrated on the evolution of those varieties of plants which are more yielding, resistant to pests and diseases, tolerant to harsh environment and can withstand the water log and saline soil conditions.

Section-II

Comprehensive Questions with Answers

1. What is metabolism?

Ans: **Definition:** "The sum of all the constructive (anabolism) and destructive (catabolism) chemical reactions taking place in cells is called metabolism".

Explanation: A living organism performs a wide variety of activities during its life. All of these functions require some chemical energy. This energy is supplied to the organism through the digestion of food ingredients like carbohydrates, fats and proteins. On the other hand there are some reactions, which are constructive like the formation of some non-essential amino acids and other organic molecules. All of these molecules are vital for the normal growth and repair of cells and tissues.

Division of Labour: This term refers to the specified duties, which are performed by different cells of different organs of the body like liver, kidneys, heart etc.

2. Define digestion? Why food is required for our body?

Ans: **Definition of Digestion**: "The conversion of large non absorbable molecules into smaller absorbable ones is called digestion".

ختم نبوت ﷺ زندہ باد　　　　عظمت صحابہ زندہ باد

السلام علیکم ورحمۃ اللہ وبرکاتہ:

معزز ممبران: آپ کا وٹس ایپ گروپ ایڈ من "**اردو بکس**" آپ سے مخاطب ہے۔

آپ تمام ممبران سے گزارش ہے کہ:

- گروپ میں صرف PDF کتب پوسٹ کی جاتی ہیں لہذا کتب کے متعلق اپنے کمنٹس / ریویوز ضرور دیں۔ گروپ میں بغیر ایڈ من کی اجازت کے کسی بھی قسم کی (اسلامی وغیر اسلامی، اخلاقی، تحریری) پوسٹ کرنا سختی سے منع ہے۔
- گروپ میں معزز، پڑھے لکھے، سلجھے ہوئے ممبرز موجود ہیں اخلاقیات کی پابندی کریں اور گروپ رولز کو فالو کریں بصورت دیگر معزز ممبرز کی بہتری کی خاطر ریموو کر دیا جائے گا۔
- کوئی بھی ممبر کسی بھی ممبر کو انباکس میں میسیج، مس کال، کال نہیں کرے گا۔ رپورٹ پر فوری ریموو کر کے کاروائی عمل میں لائے جائے گی۔
- ہمارے کسی بھی گروپ میں سیاسی و فرقہ واریت کی بحث کی قطعاً کوئی گنجائش نہیں ہے۔
- اگر کسی کو بھی گروپ کے متعلق کسی قسم کی شکایت یا تجویز کی صورت میں ایڈ من سے رابطہ کیجئے۔
- سب سے اہم بات:

گروپ میں کسی بھی قادیانی، مرزائی، احمدی، گستاخِ رسول، گستاخِ امہات المؤمنین، گستاخِ صحابہ و خلفائے راشدین حضرت ابو بکر صدیق، حضرت عمر فاروق، حضرت عثمان غنی، حضرت علی المرتضیٰ، حضرت حسنین کریمین رضوان اللہ تعالیٰ اجمعین، گستاخ اہلبیت یا ایسے غیر مسلم جو اسلام اور پاکستان کے خلاف پراپیگنڈا میں مصروف ہیں یا ان کے روحانی و ذہنی سپورٹرز کے لئے کوئی گنجائش نہیں ہے لہذا ایسے اشخاص بالکل بھی گروپ جوائن کرنے کی زحمت نہ کریں۔ معلوم ہونے پر فوراً ریموو کر دیا جائے گا۔

- تمام کتب انٹرنیٹ سے تلاش / ڈاؤنلوڈ کر کے **فری آف کاسٹ** وٹس ایپ گروپ میں شیئر کی جاتی ہیں۔ جو کتاب نہیں ملتی اس کے لئے معذرت کر لی جاتی ہے۔ جس میں محنت بھی صَرف ہوتی ہے لیکن ہمیں آپ سے صرف دعاؤں کی درخواست ہے۔
- عمران سیریز کے شوقین کیلئے علیحدہ سے عمران سیریز گروپ موجود ہے۔
- **لیڈیز کے لئے الگ گروپ کی سہولت موجود ہے جس کے لئے ویریفکیشن ضروری ہے۔**
- اردو کتب / عمران سیریز یا سٹڈی گروپ میں ایڈ ہونے کے لئے ایڈ من سے وٹس ایپ پر بذریعہ میسیج رابطہ کریں اور جواب کا انتظار فرمائیں۔ برائے مہربانی اخلاقیات کا خیال رکھتے ہوئے موبائل پر کال یا ایم ایس کرنے کی کوشش ہر گز نہ کریں۔ ورنہ گروپس سے تو ریموو کیا ہی جائے گا بلاک بھی کیا جائے گا۔

نوٹ: ہمارے کسی گروپ کی کوئی فیس نہیں ہے۔ سب فی سبیل اللہ ہے

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اللہ تبارک تعالیٰ ہم سب کا حامی و ناصر ہو

Explanation: The food molecules like carbohydrates, proteins and fats are in such form that they cannot be diffused directly into the cells so these have to be broken down into smaller units so that they become available to the cells for their utilization. This process of digestion involves enzymatic activities. These enzymes are the biological catalysts produced by special cells of organism body.

Examples: The larger molecules like carbohydrates, proteins and lipids are digested into glucose, amino acids and fatty acid and glycerol respectively.

3. Briefly explain large food molecules. How they are digested?

Ans: The large food molecules are carbohydrates, proteins and fats.

Carbohydrates:

Definition: "These are the energy rich molecules composed of carbon, hydrogen and oxygen in which hydrogen and oxygen are present in the same ratio as in water".

Characteristics of Carbohydrates:

a) Carbohydrates are made up of three elements i.e. carbon, hydrogen and oxygen.

b) Available forms of carbohydrates are starch, glycogen and sugars.

c) Glucose is a form of carbohydrates, which is highly absorbable form, dissolved in blood to provide energy to each and every cell.

d) Wheat, rice, potato, sweet potato and maize are the excellent sources of starch.

e) Glycogen is found in the liver and meat of animals therefore it is also called as animal starch.

f) Starch and glycogen are called as higher carbohydrates.

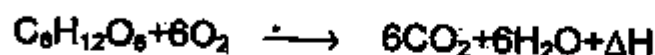
g) The higher carbohydrates are non-diffusible forms.

Digestion Process:

- Once carbohydrates are in the digestive tract of the body, they are converted into smaller diffusible molecules. These smaller molecules than travel to the blood from where they are supplied to each and every cell of the body. In the cells these molecules are metabolised.

Glucose + Oxygen ⟶ Carbon dioxide + Water + Energy

This reaction can precisely be represented by a balanced chemical equation as:

$$C_6H_{12}O_6+6O_2 \longrightarrow 6CO_2+6H_2O+\Delta H$$

Proteins:

Definition: "The polypeptide chains of amino acids formed of carbon, hydrogen, oxygen and nitrogen are called proteins".

Characteristics of Proteins:

a) The identification element of proteins is nitrogen.

b) Their sources are meat, egg, chicken, fish, pulses etc.

c) They are used to provide energy when carbohydrates and fats are deficient enough to fulfill the energy requirements of the body.

d) They are mainly used to build the body tissues and cells along with repair of the existing tissues and organs.

e) Protein molecules are large enough and cannot be diffused into the cells.

f) Proteins are made up of amino acid molecules.

Digestion Process:

Large protein molecules are broken down into amino acids, which are smaller molecules with the help of enzymes.

$$\text{Protein} \xrightarrow[\text{Enzymes}]{\text{Proteolytic}} \text{Amino Acids}$$

Fats:

Definition: "They are also consist of carbon, hydrogen and oxygen but chemically they are composed of fatty acids bonded to glycerol molecules".

Characteristics of Fats:

a) They have double energy as compared to carbohydrates and proteins.

b) Their sources are butter, oils and ghee.

c) In animals they are found in the adipose tissues.

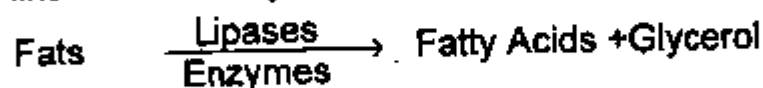
d) These are also large molecules and cannot be diffused into the cells.

e) Their monomers are fatty acids and glycerol.

f) They are used up to make various body structures or broken down to liberate energy.

Digestion Process:

Fats are also acted upon by the biological catalysts (enzymes) like lipases to break them into smaller absorbable units like different fatty acids and glycerol.

$$\text{Fats} \xrightarrow[\text{Enzymes}]{\text{Lipases}} \text{Fatty Acids} + \text{Glycerol}$$

4. Define enzymes. What is their importance and characters?

Ans:

Enzymes:

Definition: "The biological catalysts produced by specialized cells in order to facilitate or retard a chemical reaction are called enzymes".

Importance: Enzymes are the substances that are used to affect the rate of different chemical reactions taking place in the body of living organisms. Due to the action of these enzymes the reactions might be completed within a few

minutes which would take hours to be completed otherwise.

Examples: The processes like respiration, photosynthesis, digestion and assimilation are carried by the enzymes effectively.

If a compound A is to be broken down into B and C, and enzymes might facilitate this breakage.

Enzyme

$$A \xrightarrow{\text{Enzymes}} B+C$$

Characters of Enzymes:

a) Enzymes facilitate all the metabolic activities.

b) They are organic catalysts.

c) They are all formed of proteins except the co-enzyme part, which is mostly a mineral.

d) Enzymes are equally important for plants and animals.

e) Enzymes also control the most important reaction of photosynthesis being carried out in plants on which life of animals is dependent too.

$$C_6H_{12}O_6+6O_2 \xrightarrow[\text{Chlorophyll + enzyme}]{\text{Sunlight}} 6CO_2+6H_2O+\Delta H$$

f) All enzymes are protein in nature.

g) There is specificity in enzymes for their reactivity so for each type of reaction there are specific enzymes. For example:

h) Starch is converted into Sugar by Diastase.

i) Proteins are converted into amino acids by Pepsin inside the stomach of animals.

j) Enzymes are temperature specific and killed at very low and very high temperature.

k) Enzymes are also pH specific.

l) They quickly complete their reaction.

m) Enzymes can be isolated separately as crystals from the reaction media.

n) Enzymes only enhance the rate of reaction without being utilized or reacting themselves in the reaction. So at the end of reaction the enzymes remain in the original form.

5. What are the functions and composition of human blood? Write a note on the liquid part of blood.

Ans:

Blood:

It is the circulatory fluid in the body of human beings aimed for the transport of the essential substances in the body.

Importance: Blood is essential for the continuity of human life because it is the media that supplies the required substances to all the body cells necessary for their functioning including oxygen and then removes the wastes from cells and tissues including carbon dioxide. It carries the waste products to the organs specified for excretion. Another duty of blood is to keep all the cells and tissues moist which is a need for their proper functioning.

Blood Composition:

- Blood consist of a liquid and solid part.

a. Liquid Part:

It is plasma constituting 55% of blood by volume.

b. Solid Part:

These are blood cells constituting about 45% if blood by volume.

Liquid Part of Blood (Plasma):

It is mainly water constituting about 90% of whole plasma. It also contains proteins, which are 7-8%, and organic and inorganic substances, which are 2-3% by volume.

Functions of Plasma Proteins:

- There is a specialized protein in blood plasma which helps in blood clotting.

- They transport the inorganic salts.
- They form antibodies that fight against foreign antigens of diseases.
- They transport the wastes like urea, uric acid and carbon dioxide to the excretory organs.
- They transport the hormones to their specific place of reaction.
- They transport the digestion products like glucose, fatty acids, and amino acids to each cell of body.
- They lipoproteins that are the primary carriers of fats in the body. This is because some fats do not dissolve in water.

6. What are blood cells? What is their structure and functions?

Ans:

Blood Cells:

This is the solid part of blood that floats in blood plasma. They constitute about 45% of blood. Their functions and importance is given below.

Red Blood Cells:

These are also called Erythrocytes.

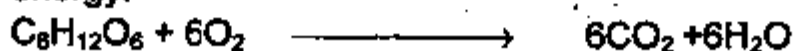
Characters:

They are most numerous of blood cells.

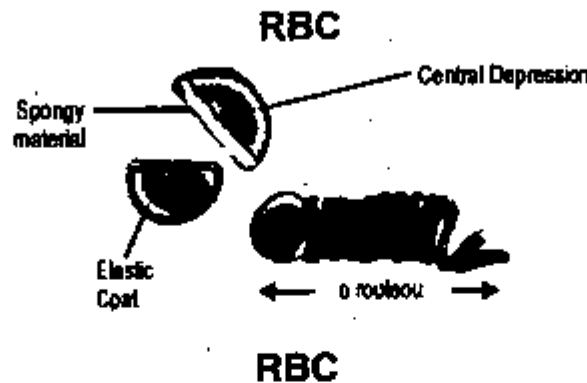
a) There are about five million of red blood cells in each cubic millimeter of blood.

b) A protein called haemoglobin gives red colour to blood.

c) Haemoglobin attaches oxygen and transport it to the cells of body where oxygen is used in the process of respiration being carried out in cells for the production of energy.

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$$

d) 120 days is the average life of red blood cells.

e) They are being constantly destroyed and formed in the body.

f) They are formed in the bone marrows and bones of breast and ribs.

RBC

RBC

White Blood Cells:

They are also called Leukocytes.

Characters:

a) The white blood cells are colourless.

b) They are irregular in shape.

c) They have prominent nucleus.

d) 7000-8000 white blood cells are present in one cubic millimeter of plasma.

e) The white blood cells fight against disease agents and give immunity against them.

f) They save our body from diseases in two ways:

   i. They just engulf and digest the antigens (bacteria/virus).

   ii. They produce some antibodies that destroy the antigens (bacteria/virus).

WBC

Platelets:

Characters:

a) Their size is least of all blood cells.

b) They are the fragments of bone marrow cells.

c) They have no nucleus.

d) They help in clotting of blood and stop it from flowing out of damaged vessels in case of wounds.

Platelets

7. Write a note on blood types. What is Rh factor?

Ans:

Blood Group:

There are some antigens on the basis of which human blood is divided into four blood groups. These antigens are controlled by genes and are specific in shape. These antigens are protein in nature.

Explanation: Every antigen has its antibody, which kills it. So in case of presence of specific antigen its antibody is not present along with it in the blood. This is how if blood with wrong group is given to a person it may cause death. This is because the antigen and antibody react leading to the blood clotting, and ultimately death.

All four blood groups along with their antigens and antibodies are given in the following table:

Blood Group	Antigen	Antibody
A	A	B
B	B	A
AB	A and B	None
O	None	A and B

It can be seen from the table that in front of each antigen the opposite antibody is present. In case of the presence of both the antigens there is no antibody in the blood while both the antibodies i.e. A and B are present in the blood in case of no antigen.

Blood Type:

Blood type is due to the presence of antigen called Rh. If this antigen is present in the blood of a person he is called as Rh +ve person and if absent he is called as Rh –ve person.

8. What is the genetic basis of an organism?

Ans. Genetic basis means those characters of the organisms, which are inherited from their parents and are related to the instinct of organism. This type of study involved some terms like chromosomes, DNA, genes etc.

Chromosomes:

Definition: "The thread like structures situated in the nucleus which becomes clear at the time of cell division containing genes on them are called chromosomes".

Explanation: Every organism has a specific structure and number of chromosomes in its nucleus. In the resting stage of cells the chromosomes are present in the form of a network. This network is called chromatin network.

Structure of Chromosomes: Each chromosome is made up of DNA and protein.

DNA:

Definition: "The hereditary material of an organism in the form of double helix of nucleic acids is called as DNA".

Explanation: The whole structure of DNA can be supposed to be in fragments in such a way that each fragment controls a particular trait. These fragments are termed to be the genes.

Genes:

Definition: "The fragment of DNA controlling a particular trait is termed to be the gene".

Explanation: The genes are the basis of inheritance that control various traits of body like eye colour, skin colour, blood group, mental level and general body structure etc. All the activities, growth and development of an organism are also controlled the genes.

Mutations:

Any sudden change in the number of chromosomes or structure (composition) of DNA is called as Mutation. Death may occur due to a mutation.

Inherited Diseases:

There are some diseases, which occur as a result of abnormalities in the chromosomes and genes. These diseases are called inherited diseases.

Examples: Haemophilia, colour blindness.

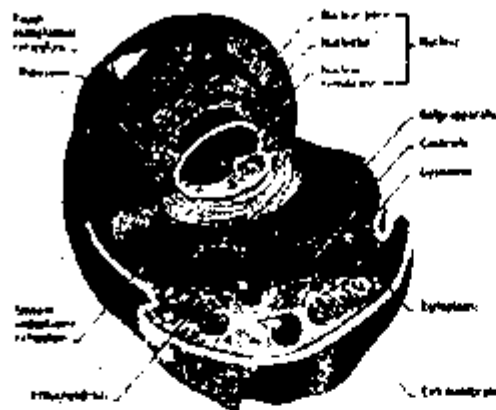
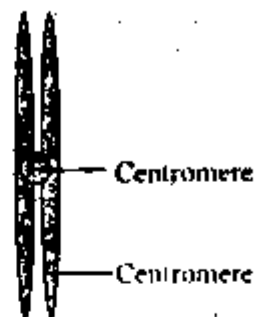
9. What is genetics? Describe the scope of genetic engineering in agriculture.

Ans:

Genetics:

Definition: "The branch of biological sciences in which organisms are studied at the level of inheritance and genes level is called genetics".

Explanation: Genetics has enable man to improve in various fields of life like agriculture and medicine. It is believed that twenty first century will be the century of biotechnology, which is a field of genetics. Other field of genetics is genetic engineering.

Genetic Engineering:

A Cell with a Nucleus **Chromosome**

Definition: "The field of genetics in which undesirable genes are removed and desired genes are introduced in then nuclei of cells is called as genetic engineering".

Explanation: There are some specific methods with the help of which specific genes are introduced into the genome of the organism as cellular level to get required characters. These characters might be the high yield of crops, production of some hormones from microbes, high milk producing cattle etc.

Biotechnology:

"It is the use of living organisms like plants, animals, bacteria, viruses and fungi for the welfare of human being".

Use of Genetic Engineering in Agriculture:

This field is applied in agriculture to get many benefits. These include:

a) Development of high yielding varieties.

b) Development of disease resistant varieties.

c) Development of drought resistant varieties.

d) Producing more flesh and milk producing livestock.

Improvement in the Crops Using Genetic Engineering:

Pakistan is an agricultural country and our nation

income, industry and thus population depend on agriculture. So it is very important that there must be ever increasing improvement in the crop yields. The crop yields can be improved by two methods:

a) Using high yielding varieties
b) Efficiently controlling pests and diseases of crops

Using High Yielding Varieties:

Yield of a crop refers to the total productivity of a crop per unit area (per acre). Yield of old crop varieties was very less so Pakistani scientists developed some high yielding varieties of crops through genetic engineering and cross breeding.

Examples: Pakistan has become self sufficient in wheat, rice, cotton and sugar cane due to the development of high yielding varieties, good economic practices, mechanization in agriculture like the use of threshers, harvesters, scrapers, tractors, drills and mechanized rice sowing machines. This improvement in agricultural production has brought foreign exchange and prosperity to the country.

Control of Plant Diseases: In Pakistan 10-30% of agricultural produce was being destroyed due to diseases. So these had to be controlled. There two methods to reduce these losses.

a. Production of Disease Resistant Varieties:

- It involves the development of those varieties of crops that resist the attack of pathogens like bacteria; fungi and viruses.
- Genetic engineering, biotechnology and cross breeding techniques are used for this purpose.
- These varieties enhance the confidence of growers and reduce their crop losses.
- The efforts made to develop cotton varieties, which are resistant against cotton leaf curl virus is an example.

b) Use of Insecticides and Fungicides:

Insecticides: "The chemicals used to kill the insects are called insecticides".

Fungicides: "The chemicals used to kill the fungi are called fungicides".

Explanation: The organisms that damage the crops are insects, rodents, weeds, fungi, viruses and bacteria. Out of these insects and fungi are the mostly more destructive. So some chemicals are used to control these organisms in the form of aerial sprays, dusts or provision through irrigation water.

10. Write a note on antibiotics and vaccines.

Ans: There are many diseases, which are caused by the pathogens. Antibiotics and vaccines are used to kill these pathogens.

Antibiotics:

Definition: "An antibiotic is a substance which is produced by an organism and is used to kill or inhibit another organism".

Explanation: Now a days there are many diseases against which antibiotics have been developed. These diseases include sore throat, pneumonia, typhoid etc. Since the development of antibiotics lives of millions of peoples have been saved.

Work of Alexander Fleming:

He was a great microbiologist of Britain who discovered antibiotics in 1929 accidentally. He was working on bacterial culture. His laboratory was not so modern and spore free. Some spores of fungi called penicillium got an entry into the laboratory and then into the bacterial culture. It was observed that the bacteria were unable to grow in the presence of this fungus.

Penicillin: It is the substance, which was isolated from the penicillium and used as an antibiotic. It was first antibiotic discovered by man. This substance was later found to be harmless to man.

Commercial Use of Antibiotics:

Penicillin was first commercially produced in 1938 and

used against many bacterial diseases. There are many synthetic antibiotics, which are being used against many pathogenic diseases whole world. One of the best characters of antibiotics is that they are safe to the cells and tissues of the human body if used according to the need. It is required that people should use the antibiotics according to the suggestion of their physician because they might injure themselves by the haphazardous and excessive use of antibiotics.

Vaccines:

Definition: "The non virulent stains of disease causing organisms which are injected into the body of the man in order to stimulate the production of antibodies are called vaccines".

Active Immunity: "It is a condition in which blood of a person produces antibodies against the disease pathogens like bacteria and fungi to kill or inhibit their growth".

Explanation: There is a natural process in the body of organisms that when some micro-organism attacks their body, the body produces some substances called antibodies, which resist the growth of these microbes or simply kill them. When non-virulent or safe stains of the same microbes are injected into the body of these organisms, their blood start producing antibodies. Now in case of any attack of virulent or disease-causing stains of the microbes, antibodies are already present in the blood and these microbes are readily killed. Such type of immunity is called induced immunity.

Work of Edward Jenner:

Edward Jenner was an English physician who was the first to discover the vaccine for a disease Small pox. This disease is caused by a virus which was later discovered in 1892.

Observations: Jenner made two observations.

- It was seen that if the disease of cowpox infects cow, the milkmaids contract the same disease but the disease was mild for both cow and milkmaids.
- It was observed that those milkmaids, which were infected by cowpox, did not contract with dreadful

disease of smallpox and became immune to it.

Experiment: Jenner inoculated a young boy with the pus obtained from blister of cowpox. Boy mildly contracted and soon recovered. He further contracted boy with the pus of small pox. Boy did not get contracted with small pox. He had become immune against small pox. This was the discovery of first vaccine.

Phenomena: Fortunately the virus of cowpox resembled the virus of small pox and the antibodies produced during the inoculation of cowpox virus were also effective against small pox virus. This made the boy immune against the later disease.

Advancements in Vaccines:

There is enormous advancement in this field today. In Pakistan vaccines are being provided to the children for immunization against polio. In this case weakened viruses are injected to the body of children of up to five years of age. This produces immunity in the children against polio.

Examples: Vaccines have been prepared against polio, T.B., cholera, measles, hepatitis etc.

11. What is recycling? Give its benefits and scope.

Ans:

Recycling:

"All the methods and procedures involved in the collection, processing and reusing of the materials which are considered to be waste and thrown away otherwise are called recycling".

The recycled materials include precious metals, broken glass, paper, newspapers, plastics, spoons etc.

Benefits:

- The original materials are reclaimed and used in the manufacture of new materials.
- The use of old materials in the manufacture of new

products generally involves less cost as compared to the use of new materials.

- Less energy and labour is involved in this process.
- This process reduces pollution both by decreasing the total volume of waste products and by decreasing pollution caused during the manufacturing process.
- It reduces the land required to damp the waste materials.

Bioconversion:

"It is a process in which the domestic wastes like glass, plastics and metals are biologically decomposed and converted into very valuable humus which is further used as a fertilizer for soil improvement".

Paper and Paper Products:

- They constitute about 20-30 % of total wastes.
- These are recycled to form cardboard, wrapping paper and newspapers.

Plastics:

- Its recycling is somewhat difficult because of the mixture of different plastics.
- These are first cut into pieces, melted and converted into small pellets. These pellets are then again melted to form the desirable structures according to need.

Recycling as an Industry:

Recycling now has become an industry especially in the developed counties. Modern techniques of biological degradation of wastes are being tested and used in this field.

Solved Exercises of Text Book

1. Complete the following statements:

i. Carbohydrates are broken down by enzymes into ________.

ii. During digestion fats are broken down into fatty acids and ________.

iii. Enzymes are made of ________.

iv. The percentage of plasma by volume in the blood is about ________.

v. A person with blood group A has ________ on his RBC.

Answers:

i)	ii)	iii)	iv)	v)
Glucoses	Glycerol	Proteins	55%	Antigen A

2. Tick (✓) the following statements either True or False:

i)	Genes are present in the cytoplasm of cell.	False
ii)	The number of chromosome in pea plant is 32.	False
iii)	Vaccines are the active germs of the disease.	False
iv)	First antibiotic was discovered by Jenner.	False
v)	Virus was discovered in 1792.	False

3. Encircle one choice a, b, c or d in each case:

i) During digestion proteins are broken down into:

a) Glucose   b) Sucrose
c) Glycerol   d) Amino acid

Ans: Amino acid

ii) The number of chromosomes in a cat is:

a) 15 Pairs b) 16 Pairs
c) 8 Pairs d) 7 Pairs

Ans: 15 Pairs

iii) A person with blood group B has following antigens:

a) Antigen A b) Antigen B
c) Antigen A & B d) None

Ans: Antigen B

iv) The shape of WBC is:

a) Circular b) Oblong
c) Rod like d) Irregular

Ans: Irregular

v) Special chemical compounds that kill the insects are called:

a) Fungicides b) Insecticides
c) Pesticides d) All

Ans: Insecticides

4. Explain the digestion of fats in the human body.

Ans:

Digestion Process of Fats In Human Body:

Fats are also acted upon by the biological catalysts (enzymes) like lipases to break them into smaller absorbable units like different fatty acids and glycerol.

$$\text{Fats} \xrightarrow[\text{Enzymes}]{\text{Lipases}} \text{Fatty Acids} + \text{Glycerol}$$

5. Give the general characteristics of enzymes.

Ans: As the enzymes are so much effective they are sensitive too. There are many characters of enzymes like:

Characters of Enzymes:

- Enzymes facilitate all the metabolic activities.
- They are organic catalysts.
- They are all formed of proteins except the co-enzyme part, which is mostly a mineral.
- Enzymes are equally important for plants and animals.
- Enzymes also control the most important reaction of photosynthesis being carried out in plants on which life of animals is dependent too.

$$C_6H_{12}O_6 + 6O_2 \xrightarrow[\text{Chlorophyll + enzyme}]{\text{Sunlight}} 6CO_2 + 6H_2O + \Delta H$$

- All enzymes are protein in nature.
- There is specificity in enzymes for their reactivity so for each type of reaction there are specific enzymes. For example:
  i. Starch is converted into Sugar by Diastase.
  ii. Proteins are converted into amino acids by Pepsin inside the stomach of animals.
- Enzymes are temperature specific and killed at very low and very high temperature.
- Enzymes are also pH specific.
- They quickly complete their reaction.
- Enzymes can be isolated separately as crystals from the reaction media.
- Enzymes only enhance the rate of reaction without being utilized or reacting themselves in the reaction. So at the end of reaction the enzymes remain in the original form.

6. Explain the composition of human blood.

Ans: **Blood Composition:** Blood consist of a liquid and solid

part.

Liquid Part: It is plasma constituting 55% of blood by volume.

Solid Part: These are blood cells constituting about 45% if blood by volume.

Liquid Part of Blood (Plasma):

It is mainly water constituting about 90% of whole plasma. It also contains proteins, which are 7-8%, and organic and inorganic substances, which are 2-3% by volume.

Functions of Plasma Proteins:

- There is a specialized protein in blood plasma which helps in blood clotting.
- They transport the inorganic salts.
- They form antibodies that fight against foreign antigens of diseases.
- They transport the wastes like urea, uric acid and carbon dioxide to the excretory organs.
- They transport the hormones to their specific place of reaction.
- They transport the digestion products like glucose, fatty acids, and amino acids to each cell of body.
- They lipoproteins that are the primary carriers of fats in the body. This is because some fats do not dissolve in water.

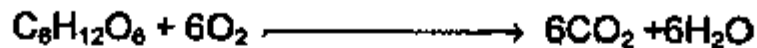
Solid Part of Blood (Blood Cells): This is the solid part of blood that floats in blood plasma. They constitute about 45% of blood. Their functions and importance is given below.

Red Blood Cells: These are also called Erythrocytes.

Characters:

a. They are most numerous of blood cells.
b. There are about five million of red blood cells in each cubic millimeter of blood.
c. A protein called haemoglobin gives red colour to blood.

d. Haemoglobin attaches oxygen and transport it to the cells of body where oxygen is used in the process of respiration being carried out in cells for the production of energy.

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$$

e. 120 days is the average life of red blood cells.

f. They are being constantly destroyed and formed in the body.

g. They are formed in the bone marrows and bones of breast and ribs.

White Blood Cells: They are also called Leukocytes.

Characters:

a. The white blood cells are colourless.

b. They are irregular in shape.

c. They have prominent nucleus.

d. 7000-8000 white blood cells are present in one cubic millimeter of plasma.

e. The white blood cells fight against disease agents and give immunity against them.

f. They save our body from diseases in two ways:

    i. They just engulf and digest the antigens (bacteria/virus).

    ii. They produce some antibodies that destroy the antigens (bacteria/virus).

Platelets:

Characters:

a. Their size is least of all blood cells.

b. They are the fragments of bone marrow cells.

c. They have no nucleus.

d. They help in clotting of blood and stop it from flowing out of damaged vessels in case of wounds.

7. Discuss the blood group in man.

Ans: See Q. No. 7 for answer.

8. Write notes on: genetic engineering, control of plant diseases and recycling.

Ans:

Genetic Engineering:

Definition: "The field of genetics in which undesirable genes are removed and desired genes are introduced in then nuclei of cells is called as genetic engineering".

Explanation: There are some specific methods with the help of which specific genes are introduced into the genome of the organism as cellular level to get required characters. These characters might be the high yield of crops, production of some hormones from microbes, high milk producing cattle etc.

Use of Genetic Engineering in Agriculture:

This field is applied in agriculture to get many benefits. These include:

- Development of high yielding varieties.
- Development of disease resistant varieties.
- Development of drought resistant varieties.
- Producing more flesh and milk producing livestock.

Control of Plant Diseases:

In Pakistan 10-30% of agricultural produce was being destroyed due to diseases. So these had to be controlled. There two methods to reduce these losses.

a) Production of Disease Resistant Varieties:

- It involves the development of those varieties of crops that resist the attack of pathogens like bacteria, fungi and viruses.
- Genetic engineering, biotechnology and cross breeding techniques are used for this purpose.

- These varieties enhance the confidence of growers and reduce their crop losses.
- The efforts made to develop cotton varieties, which are resistant against cotton leaf curl virus is an example.

b) Use of Insecticides and Fungicides:

Insecticides: "The chemicals used to kill the insects are called insecticides".

Fungicides: "The chemicals used to kill the fungi are called fungicides".

Explanation: The organisms that damage the crops are insects, rodents, weeds, fungi, viruses and bacteria. Out of these insects and fungi are the mostly more destructive. So some chemicals are used to control these organisms in the form of aerial sprays, dusts or provision through irrigation water.

Recycling:

Definition: "All the methods and procedures involved in the collection, processing and reusing of the materials which are considered to be waste and thrown away otherwise is called recycling".

The recycled materials include precious metals, broken glass, paper, newspapers, plastics like spoons etc.

Benefits:

- The original materials are reclaimed and used in the manufacture of new materials.
- The use of old materials in the manufacture of new products generally involves less cost as compared to the use of new materials.
- Less energy and labour is involved in this process.
- This process reduces pollution both by decreasing the total volume of waste products and by decreasing pollution caused during the manufacturing process.
- It reduces the land required to damp the waste materials.

Bioconversion: "It is a process in which the domestic wastes like glass, plastics and metals are biologically decomposed and converted into very valuable humus which is further used as a fertilizer for soil improvement".

Paper and Paper Products:

- They constitute about 20-30 % of total wastes.
- These are recycled to form cardboard, wrapping paper and newspapers.

Plastics:

- Its recycling is somewhat difficult because of the mixture of different plastics.
- These are first cut into pieces, melted and converted into small pellets. These pellets are then again melted to form the desirable structures according need.

Recycling as an Industry: Recycling now has become an industry especially in the developed counties. Modern techniques of biological degradation of wastes are being tested and used in this field.

Section-III

Short Questions with Answers

1. What is the structural and functional unit of a living body?

Ans: The structural and functional unit of a living body is cell. The structural unit means that all the body mass consists of millions and billions of cells and functional unit means that any function performed by body is initiated at the cellular level.

2. Define biotechnology.

Ans: The biotechnology is the branch of biological sciences in which we study all the possible methods to use the living

organisms like plants, animals, viruses, bacteria, fungi and algae etc. in the best interest of human being.

3. What is metabolism?

Ans: Metabolism refers to all the constructive and destructive chemical reactions which are taking place in the cells. These include photosynthesis, respiration and digestion etc.

4. What is the importance of physical grinding of food when it is inside our mouth?

Ans: When food is present inside our mouth it is ground with the help of teeth. It is very important mechanism because it enables the food to be broken down into smaller pieces, which increases the surface area of food thus providing more space to the enzymes to react.

5. Why digestion is necessary?

Ans: The food ingredients become available to us when they dissolve in our blood. The form of food in which we eat it consists of so large particles that cannot be absorbed into the blood through intestinal walls. So the process of digestions converts it into so mall molecules that can diffuse into the blood and become available to us.

6. How enzymes work?

Ans: Enzymes work just like the catalysts. They increase the rate of a chemical reaction. Their property is that they themselves do not disintegrate in a chemical reaction.

7. What is the nature of enzymes?

Ans: All the enzymes are biological in nature. It means that only the living organisms produce them. Chemically the enzymes are proteins sometimes also containing a co-factor, which is mostly a mineral nutrient.

8. How energy becomes available to our body from carbohydrates?

Ans: The carbohydrates especially glucose are broken down into water and carbon dioxide in the presence of

enzymes liberating large amount of energy in the form of ATPs. This energy is then released and used in our daily activities.

9. What is the absorbable form of proteins?

Ans: The absorbable form of proteins is amino acid. Polypeptide chains of proteins are broken down by hydrolysis in the presence of proteolytic enzymes and converted into amino acids.

10. What is the difference between digestion and absorption?

Ans: In case of digestion the food is converted into diffusible small molecules from non-diffusible large molecules while in case of absorption the diffusible small molecules are diffused into the blood stream.

11. Differentiate between absorption and assimilation.

Ans: When the digested food ingredients become diffused into the blood through the intestinal membrane the process is called absorption while the ultimate utilization of the food ingredients for the formation of body cells is called assimilation.

12. Why enzymes are killed by high temperature?

Ans: As all the enzymes are protein in nature and protein coagulates on high temperature. Thus enzymes are killed or coagulated on high temperature.

13. What is the importance of platelets in the blood clotting mechanism?

Ans: In case of any damage to the blood vessels, blood starts coming out of it. There is a protein (fibrinogen) that coagulates on its exposure to the external environment and forms a net on the exit point of blood vessel. The small platelets get trapped to the net and close the way of bleeding.

14. How blood proteins assist in the process of excretion?

Ans: There are some proteins in blood plasma that transport the waste products to the excretory organs. For example carbon dioxide is carried to the lungs and urea and uric acid are carried to the kidneys.

15. What would happen if sunlight were removed?

Ans: If there would not be any sunlight plants would not be able to produce food which is currently being produced by them using sunlight during the process of photosynthesis. As there would be no plants so no food would be available to the animals and humans. This would lead to the death of life on earth.

16. Why an antibody is not present against its own antigen in the blood?

Ans: The function of antibody is to cause the inactivation or coagulation of its antigen. So the presence of antibody would cause death of the organism therefore the antibody of that antigen is always absent in the blood of same person.

17. Why it is said that donation of blood does not affect the health of man?

Ans: The white and red blood cells are being formed regularly inside our body. That is why in case of blood donation it is again formed without any permanent disorder of the body.

18. Is there any alternative to human blood?

Ans: There is no alternative to human blood. There is no artificial way to produce it and also there is no known animals blood that would be compatible to human blood. So only a healthy person can provide blood to another person in case of need.

19. How immunity is correlated to the availability of white blood cells?

Ans: In case of any foreign contamination the white blood

cells provide immunity to the body. They either engulf the foreign organisms or produce some chemicals that fight against them.

20. What is the location of genes on chromosomes?

Ans: The chromosomes are made up of DNA which consists of double strand of nucleic acids coiled upon each other. The segments of DNA containing a specific set of nucleic acids are called the genes.

21. How the chromosome number is maintained in a species in the next generations?

Ans: During the process of gamete formation, the number of chromosomes becomes half (haploid) both in male and female. When the fertilization takes place between male and female organisms the male gametes (sperms) fuse into the female gamete (egg/ ova) thus again restoring the original number of chromosomes. This process continues from generation to generation.

22. How genetic engineering is helpful in agriculture?

Ans: Genetic engineering is a technique by which the undesired genes can be removed and desirable genes can be introduced into the genetic make up of a plant. So by these techniques the disease resistant characters, high yielding and drought tolerant characters can be introduced into the plants.

23. What is the difference between chromatin network and chromosomes?

Ans: The genetic material present inside the nucleus is called chromatin network when cell is in the resting phase. When cell is divided by mitosis or meiosis the genetic material appears in the form of threads. These thread like structures are called chromosomes.

24. What is the importance of control of diseases of plants in improving yields?

Ans: In Pakistan diseases cause loss in the yields upto about 10% to 30%. This loss in very high as compared to the diseases loss in other countries. So to improve our yields

we have to control the diseases by different modern methods.

25. How cross breeding is helpful to evolve disease resistant varieties?

Ans: Cross breeding is a techniques in which disease resistant wild varieties of a crop are crossed with the productive commercial variety being grown in the fields. This provides a chance that the disease resistant character may be introduced into the productive commercial variety.

26. What are the characters of an antibiotic to be used it against human infections?

Ans: The antibiotic used against human infections should be much effective against the foreign organisms. It should be a wide spectrum antibiotic and should have no bad hazards on human health.

27. Why Alexander Flaming is famous for?

Ans: Alexander Flaming is a scientist who discovered first antibiotic i.e. Penicillin, from a fungus called Penicillium. He was doing experiments on bacteria. His bacterial culture got contaminated by the fungus. The fungus thus causing the contamination restricted the bacterial growth.

28. Why is necessary to use vaccines before the onset of disease?

Ans: The vaccine is always used before the onset of disease. This is because the use of vaccines causes the organism to become immune against that disease. When the disease organisms attack the body, the immunity makes them ineffective.

29. Why English Physician Edward Jenner is famous?

Ans: Jenner is the scientist who discovered the vaccine for the first time. He conducted his experiments on a young boy. He infected the boy with two diseases i.e. one was mild cowpox and the other was deadly smallpox.

30. How first vaccine was discovered?

Ans: A young boy was injected with the organisms of mild disease, cowpox to check its immunity against the dreadful disease, small pox. Luckily the two disease organisms were related to each other so body got immuned against the small pox. When he was inoculated with the small pox organisms, he did not develop the disease.

31. Why it beneficial to use recycled raw materials rather than new for the manufacturing of new products?

Ans: The use of recycled materials, as raw for the manufacture of goods is beneficial because it not only costs less but also decreases the pollution from the environment. It reduces the land to be used for the dumping of the discarded wastes.

32. What is degradable and non-degradable material?

Ans: The degradable materials are those materials which can be degraded by the decomposing bacteria and fungi. These include vegetable, fruit wastes etc. On the other hand non-degradable materials are those that cannot be decomposed by such microbes.

33. How home wastes can be used in best way?

Ans: Home wastes can be used in a best way by putting it into small holes made into the soil. This converts these wastes into valuable fertilizer that can be used for home plantation very effectively.

34. Why the recycling of plastic is difficult?

Ans: Plastic recycling is difficult because there are many types of plastics, which are mixed together. It is difficult to separate them.

35. How solid waste pollution reduces the resources available to man in addition to other problems?

Ans: The total natural available resources available to us are always constant. When we dump off a huge amount of

materials as wastes, they become unavailable to us reducing the total amount of resources.

36. The organ systems of our body are interdependent. Comment.

Ans: The organ systems of our body are interrelated to each other. For example digestive system provides the food ingredients to the blood. Now circulatory system carries it to different body parts for consumption according to need. The respiratory system provides oxygen to circulatory system that carries it to the cells for oxidation of food ingredients.

a) Chose the most appropriate choice:

1. Sum of all the destructive and constructive chemical reactions of cells is:

a) Anabolism b) Catabolism
c) Equilibrium d) Metabolism

2. The_____ is the structural and functional unit of life.

a) Mitochondrion b) Cell
c) Chromosomes d) Nucleus

3. Starches are digested in the form of:

a) Amino acid b) Fats
c) Glucose d) Glycogen

4. The food is digested into smaller units by the action of:

a) Enzymes b) Glucose
c) Microbes d) Temperature

5. All sugars are digested into:

a) Glucose b) Amino acids
c) Fatty acids d) Glycerol

6. **Glycogen is called animal's:**
   a) Fooder b) Diet
   c) Starch d) Food

7. **Starch and glycogen are higher:**
   a) Carbohydrates b) Proteins
   c) Vitamins d) Oils

8. **During digestion proteins are broken down into:**
   a) Fatty acids b) Glucose
   c) Amino acids d) Cellulose

9. **As compared to carbohydrates and proteins fats have____ amount of energy.**
   a) Four times b) Triple
   c) Same d) Double

10. **During digestion____ are broken down into fatty acids and glycerol.**
    a) Fats b) Carbohydrates
    c) Proteins d) Vitamins

11. **Growth of cells and body is the result of:**
    a) Sweating b) Circulation
    c) Excretion d) Assimilation

12. **Most important activity carried out by the plants is:**
    a) Metabolism b) Photosynthesis
    c) Assimilation d) Respiration

13. **_____ are made up of proteins.**
    a) Enzymes b) Vitamins
    c) Fats d) Glycerol

14. **Main transporting fluid of human body is:**
    a) Water b) Fluid
    c) Blood d) Oil

15. **Blood has two parts, plasma and:**
    a) Proteins b) Cells
    c) enzymes d) Minerals

16. **Percentage of cells in blood is:**
    a) 45 b) 25
    c) 35 d) 54

17. Percentage of water in the blood plasma is:
a) 10 b) 90
c) 30 d) 45

18. Each cubic millimeter of blood contains___ of red blood cells.
a) Nine million b) Five million
c) Fifteen million d) Fifty million

19. Red blood cells contain a protein that provides them red colour is:
a) Diastase b) Fibrinogen
c) Lipase d) Haemoglobin

20. 120 days is the average life of:
a) WBC b) DNA
c) RBC d) RNA

21. The shape of white blood cells is:
a) Rectangular b) Diagonal
c) Circular d) Irregular

22. _____ of white blood cells are present in one cubic millimeter of blood.
a) 7000-8000 b) 700-800
c) 1700-1800 d) 170-180

23. A change in the number of chromosomes or composition of DNA is called:
a) Mitosis b) Duplication
c) Polymerization d) Mutation

24. White blood cells save us from:
a) Co-factors b) Antibodies
c) Mutations d) Diseases

25. Platelets have ___ size as compared to red and white blood cells.
a) Bigger b) Smaller
c) Huge d) Same

26. Use of life for the benefit of human being is called:
a) Biotechnology b) Biochemistry
c) Genetics d) Biodiversity

27. Antigens are special:
a) Antigens b) Fats
c) Antibodies d) Proteins

28. Every cell has a nucleus in the______ position.
a) Central b) Lateral
c) Corner d) Dorsal

29. Each chromosome is made up of DNA and:
a) Gene b) Chromosomes
c) Proteins d) RNA

30. DNA is:
a) Dioxyribose Nucleic Acid
b) Deoxyribose Nucleic Acid
c) Deltaoxyribose Nucleic Acid
d) Deribose Nucleic Acid

31. Percentage crop damage in Pakistan by diseases is:
a) 10-20 b) 20-30
c) 20-40 d) 10-30

32. Plant diseases are controlled by_____ methods.
a) Four b) Many
c) Five d) Two

33. Specific chemicals that kill the molds are called:
a) Moldicides b) Fungicides
c) Insecticides d) Pesticides

34. Fungicides are used to kill _____ pathogens.
a) Viral b) Microbial
c) Fungal d) Algal

35. Percentage of paper wastes is:
a) 50 b) 70
c) 95 d) 90

36. _____ reduces the garbage and pollution.
a) Mills b) Industries
c) Population d) Recycling

37. _____ is a big environmental problem of this age.
a) Industry b) Pollution
c) Agriculture d) Livestock

38. Virus was discovered in:
- a) 1782 b) 1982
- c) 1872 d) 1892

39. English physician Jenner was born in:
- a) 1749 b) 1799
- c) 1479 d) 1769

40. Penicillin was commercially produced for the first time in:
- a) 1988 b) 1938
- c) 1828 d) 1838

Answers:

1.	d	11.	d	21.	d	31.	d
2.	b	12.	b	22.	a	32.	d
3.	c	13.	a	23.	d	33.	b
4.	a	14.	c	24.	d	34.	c
5.	a	15.	b	25.	b	35.	d
6.	c	16.	a	26.	a	36.	d
7.	a	17.	b	27.	d	37.	b
8.	c	18.	b	28.	a	38.	d
9.	d	19.	d	29.	c	39.	a
10.	a	20.	c	30.	b	40.	b

Fill in the blanks and True or False questions are not included in the examination paper. However the same are being given for Memory Test of students.

a. *Fill in the blanks:*

1. Sum of all activities _____ and _____ is called metabolism.
2. The activities performed by different cells will be called_____.

3. The food is broken down into its _____ units.
4. Sugar is digested and changed into_____.
5. _____ is called as animal starch.
6. Proteins are broken down into _____ during digestion.
7. During digestion fats are converted into ____ and ____.
8. Amino acids, fatty acids and glycerols are also used to make various _____ of the cells.
9. Growth of cell and of the body is result of _____.
10. Enzymes are _____ catalysts.
11. The whole process of the life is at the mercy of _____.
12. In the presence of enzyme glycogen is converted into _____.
13. Proteins have _____ and non-diffusible molecules.
14. Amino acids are _____ molecules that diffuse into _____.
15. The fats have _____ energy as compared to carbohydrates and proteins.
16. The fats are converted by digestion into small and _____ molecules.
17. Amino acids, fatty acids and glycerol are used to make various structures of cells. Phenomena is called _____.
18. Enzymes are essential for _____ of life.
19. Blood is main _____ of the human body.
20. The blood has ____ main parts.
21. Liquid part of blood is called_____.
22. By volume ____ percent of the blood consists of different types of cells.
23. IN plasma _____ percent of waste is present.
24. Proteins, which are present in plasma, transport in-organic_____.
25. Anti bodies save us from ____.

26. Each cubic millimeter of blood contains about ___red blood cells.
27. Red blood cells contain protein called _____.
28. Hemoglobin provides _____ to all the body cells.
29. Average life a red blood cell is ____ days.
30. One cubic millimeter of blood has _____ white blood cells.
31. White blood cells are important in combating the____ and giving _____ against diseases.
32. The blood cells do not containing the nucleus are called_____.
33. Human blood is divided into ____ groups.
34. Antibiotics are produced against their respective_____.
35. One factor is used to determine blood types is called _____.
36. Rh factor is due to ____ or _____ of Rh antigens.
37. Each chromosome is made of ____ and ____.
38. A change in the number of chromosome or composition of DNA is called_____.
39. Branch of biology that deals with study of genes and inheritance is called _____.
40. It is believed that 21st century will be the century of ______.
41. In Pakistan crop diseases destroy _____to___ % of our production.
42. The chemical compounds used to kill the insects are called_____.
43. Fungicides are used to kill_____.
44. Paper and its products are ____ to ____ of wastes.
45. Any substance that is produced by an organism inhibiting or killing micro-organisms is called_____.

46. Biological name of blue green mold is _____.
47. In _____ penicillin was commercially produced for the first time.
48. Recycling is now____ industry.
49. Recycling has greatly helped to ______.
50. Two important discoveries i.e. _____ and _____ have saved humanity from many fatal diseases.
51. The enzyme ____ converts proteins into amino acids.
52. _____ is an enzyme converting starch into simple sugar.

Answers:

1.	destructive, constructive	27.	haemoglobin
2.	metabolic activities	28.	oxygen
3.	smaller	29.	120
4.	glucose	30.	7000,8000
5.	glycogen	31.	diseases, immunity
6.	amino acids	32.	platelets
7.	glycerol, fatty acids	33.	four
8.	structures	34.	antigens
9.	assimilation	35.	Rh factor
10.	organic	36.	presence, absence
11.	enzymes	37.	DNA, proteins
12.	glucose	38.	mutation
13.	large	39.	genetics
14.	small, blood	40.	biotechnology
15.	double	41.	10-30%
16.	diffusible	42.	insecticides
17.	assimilation	43.	fungal pathogens
18.	processes	44.	20-30%
19.	transporting	45.	antibiotics
20.	two	46.	penicillium
21.	plasma	47.	1938
22.	45%	48.	profitable
23.	90	49.	check
24.	iron	50.	antibiotics, vaccines
25.	diseases	51.	pepsin

26.	five million	52.	diastase

b) Indicate the True/ False Statements:

1. The sum of only the constructive chemical reactions taking place inside the cells is called as metabolism.
2. Different organs make up organ system and different organ systems form an organism.
3. The activities performed by different organs are called metabolism.
4. Proteins are available in the form of starches, glycogen and glucose.
5. Blood diffuses into the blood from where it is supplied to other parts of body.
6. Proteins are digested by pepsin and broken down into fatty acids.
7. Vitamins are available in the form of ghee, butter and oils.
8. Amino acids, fatty acids and glycerol are used to make different structures of the cells of body.
9. Growth of cells and body is the result of biological process of excretion.
10. Enzymes are the organic and biological catalysts.
11. The whole process of life is at the mercy of enzymes.
12. Enzymes are made up of proteins and fats.
13. Enzymes are not affected by temperature fluctuations.
14. Blood is the main excretory fluid in the body.
15. The blood has four main parts.
16. Percentage of plasma in blood is 55%.
17. Fluid portion of blood contains proteins, water, wastes and platelets.
18. The solid part of blood is called plasma.
19. Haemoglobin is a protein contained by red blood cells.

20. Red blood cells are very important in combating the diseases.
21. Platelets are the fragments of bones.
22. The blood group of man is associated with the Rh antigen.
23. Each chromosome consists of DNA and protein.
24. DNA stands for diamino nucleic acid.
25. Gene is the basic unit of inheritance.
26. Change in the number of chromosomes or structure of DNA is called genetics.
27. Diseases cause a loss of less than 10% of total crop production in Pakistan.

Answers:

1. False	10. True	19. True
2. True	11. True	20. False
3. False	12. False	21. True
4. False	13. False	22. False
5. True	14. False	23. True
6. False	15. False	24. False
7. False	16. True	25. True
8. True	17. False	26. False
9. False	18. False	27. False

c. *Identify and label the following figures:*

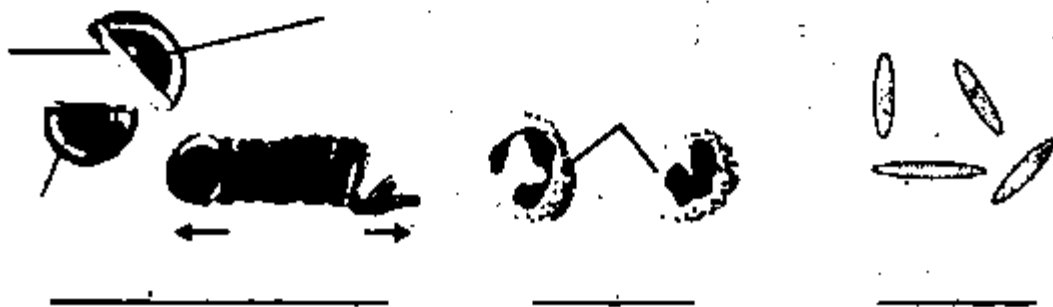
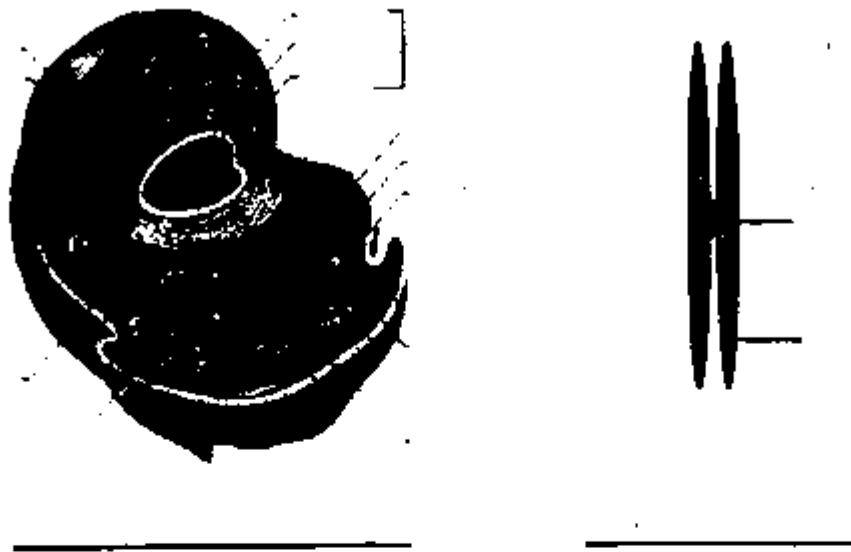



Figure 1:

Figure 2:

4 Man and Health

Section-I

Introduction to Chapter

Contents:

In this chapter following topics are discussed.

- Major Food Components With Their Sources, Functions And Deficiency Symptoms.
- Energy Provided By Different Foods.
- Energy Required By Body At Different Stages Of Life.
- Coordinate Systems, Types And Functions.
- The Process Of Aging And Causes.
- Requirements For A Healthy Life.
- First Aid Requirements At Different Emergencies.

Concepts:

1. Why there is a need to divide food into different components?

Ans: The food is divided into different components in order to provide different food components according to their need. In case of some physical disorder the deficiency of the specific component is sorted out and then provided through its different sources. The division of food components is also necessary for the formation of different food items like synthetic juices etc.

It is also important to point out the food components that either they are to provide energy, build body tissues, regulate the cellular metabolism etc. or just nothing. There are some components of food that are just to make the food bulky like fibres. Although fibres are the carbohydrates but do not have any function and are not even absorbed in the body. So in case of deficiency of some proteins, fats or carbohydrates etc. these fibres are not recommended.

2. Why knowledge of first aid is necessary for us?

Man is always exposed to different type of dangers and in case of emergency doctor is not always present at the spot. In such conditions it is the duty of other people to carry some practices to save the life of that person. If it is not possible then he must carry the injured person to the nearest hospital as soon as possible.

1. Why our body requires energy? Give a list of major components of food and their functions.

Ans: There are many activities, which our body has to perform in the daily life. There are two types of these activities.

Voluntary: These are those activities, which are performed by

our choice. These include walking, running, talking, moving our body organs etc.

Involuntary: These are those activities, which are not performed by us. They are continuously in progress without our will and choice. These include heartbeat, movements of vessels, liver, kidneys etc.

All of these activities require some energy for their performance. Energy is also required for keeping our body warm. This energy is provided to the body through the burning of food ingredients inside the cells.

Energy Production: Energy is produced in our body in the form of ATP (Adenosine Triphosphate). The process of break down of food molecules taking place inside our body is highly specialized and controlled by enzymes. The energy produced in taken up by special molecules called ATPs.

ATP: These are energy rich molecules that take energy as a result of combustion of food and provide it to all parts of our body where it is needed.

Components of Food:

There are six components of food:

i. Carbohydrates
ii. Proteins
iii. Fats
iv. Minerals
v. Vitamins
vi. Water

Functions of Food:

Our body needs food for many purposes. Most important of these are:

a) Food is needed to provide energy for the performance of various activities.
b) Food is needed to provide proteins for the growth, development and repair of body cells and tissues.
c) Mineral and vitamin contents of food are needed for the regulation of various body functions.

2. What are energy components of food? Explain them briefly.

Ans: The energy components of food are those which can provide energy on their metabolism. These are carbohydrates, proteins and fats.

Carbohydrates:

- These are organic molecules which are made up of carbon, hydrogen and oxygen.
- Hydrogen and oxygen are present in the same ratio as in water.
- Most common sources of carbohydrates are sugar, flour, rice, potato etc.
- They are the cheapest source of energy.
- Simplest form of carbohydrates is glucose.
- Carbohydrates are metabolized during respiration to produce energy.
- There are different forms of carbohydrates found in different foods:
  - a) Sugar cane provides sucrose.
  - b) Potato, wheat, rice, sweet potato and maize provide starch.
  - c) Liver and muscles provide glycogen.
  - d) Cotton fibers provide cellulose.

Fate of Starch in Body:

Starch is the main component of our food which are composed of many small units i.e. glucose. During the process of digestion these starches are first converted into glucose molecules. These molecules are diffused into the blood from where they are supplied to each and every cell of the body. Once they are inside the cells they are metabolized and produce energy which is utilized by the body.

Proteins:

a) Proteins are composed of carbon, hydrogen, oxygen and nitrogen.

b) The identification element of proteins is nitrogen.

c) The smallest unit of proteins is amino acid.

d) Proteins are of smaller size as compared to carbohydrates.

e) Number of amino acids varies from 30 to 3000.

f) Human body is build up of protein molecules.

g) They are the most abundant molecules in our body.

h) Our muscles, liver, brain, blood, nails and hairs are made up of proteins.

i) All the antibodies are protein in nature that provide immunity to the body.

j) Sources of protein include pulses, peas, beans, meat, egg, milk, liver, yogurt and beef etc.

Fate of Proteins of Food:

Proteins are first digested in the stomach to form smaller units i.e. amino acids. These smaller molecules first diffuse into the blood from where they are provided to the cells. In the cells they are either used up to make desirable proteins or used as a source of energy.

Role of Protein:

a) They help in respiration process. A protein called Haemoglobin performs this duty to carry oxygen and carbon dioxide.

b) Insulin is important for the conversion of glucose into glycogen.

c) Shortage of insulin causes diabetes.

d) All enzymes are protein in nature.

e) Proteins are basic body building material.

f) In certain cases they also provide energy to the body.

g) Various structures of the cell are made up of proteins.

Fats:

- These are the organic compounds, which are composed of fatty acids and glycerol.

- They provide maximum energy to the body after burning which is double of the energy provided by carbohydrates and proteins.
- They are utilized as energy source only when carbohydrates are not available.
- Digestion process break large fat molecules into fatty acids and glycerol, which are diffused into the blood and supplied to body cells and tissues.

3. How minerals and water are important in our life?

Ans: Minerals and water are those components of our food that do not provide energy. Their main function is to regulate different metabolic processes.

Minerals:

These are elements which we taken other than different compounds of food.

Role:

- These elements are necessary for the normal functioning of our body.
- Minerals are required in small amounts but are very important.
- They do not provide energy to the body but regulate energy metabolism.

Examples: Minerals, which are very much important for our body are sodium, calcium, phosphorous, iron, magnesium, iodine, copper, chlorine, cobalt, sulphur and potassium,

Water:

Water constitutes almost 70% of human body. It plays vital role for the survival of life on earth. It has many functions in our body to perform.

Functions of Water:

a) It dissolves the substances and carries them to the cells. So its solvent properties are very important.
b) It dissolves nitrogenous wastes in it like urea and then excretes it out of the body in the form of urine.

c) It is the major component of blood and helps in its circulation.

d) It evaporates from our body in form of vapours causing sweating and produces a cooling effect in hot days of summer.

e) It makes food soft for easy and proper digestion.

4. What are vitamins? Give types along with the role, deficiency symptoms and sources of each type of vitamin.

Ans:

Vitamins:

These are the compounds, which are required by our body in small amounts.

There are many types of vitamins. We divide vitamins into two categories.

Fat Soluble Vitamins:

These are those vitamins, which can dissolve in fats and cannot dissolve in water. Therefore these vitamins are mostly found in fats. These are:

Vitamin A:

a) This vitamin is essential for the growth of body especially during childhood.

b) Night blindness may be caused by its deficiency.

c) Its sources are milk, butter, fish, fruits, beet, yellow of egg, liver, maize, carrot, mustard, and turnip.

Vitamin D:

a) This vitamin helps in the metabolism of calcium and phosphorous.

b) Bones are weakened by its deficiency.

c) Our skin synthesizes this vitamin in sunlight.

d) Its sources are eggs, butter, cod-liver oil and milk.

Vitamin E:

a) It is essential for the normal working of our nervous

system.

b) Working of vitamin A and C is not normal in its deficiency.

c) Its sources are groundnut, eggs, milk, butter, liver salad, beet, beans, carrot and cabbage.

Vitamin K:

a) It helps the blood coagulation if some injury occurs.

b) Proper working of liver facilitated by its activity.

c) Malfunctioning of liver may be caused due to its deficiency.

d) Its sources are cabbage, eggs, tomato, spinach and soybean.

Water Soluble Vitamins:

There are some vitamins that can dissolve in water. These are classified as water-soluble vitamins. These are:

Vitamin B:

a) It is a complex of about ten different vitamins.

b) More common members of this group are B_1, B_2 and B_{12}.

Vitamin B_1:

a) It is also called Thiamine.

b) Digestion of carbohydrates is facilitated by its activity.

c) It helps in the proper growth of body.

d) A disease called Beri Beri is caused due to its deficiency.

e) Its sources are wheat, rice-husk, maize, beans, pulses, nuts and almond.

Vitamin B_2:

a) It is also called Riboflavin.

b) Digestion and assimilation of proteins is facilitated by its activity.

c) Food does not become the part of body in its absence.

d) Children remain weak with stunted growth its

deficiency.

e) Its sources in case of animals are liver, heart and kidneys.

f) Its sources in case of plants are eggs, meat, milk, wheat, prawn, mint, pulses, groundnut and spinach.

Vitamin B_{12}:

a) It is also called Cyanocobatamine.
b) It is found in the blood forming tissues.
c) Pernicious anaemia may be caused due to its deficiency.
d) Its sources are liver, chicken and fish.

Vitamin C:

a) It is also called ascorbic acid.
b) It keeps gums and teeth healthy.
c) Formation of blood and healing of wounds is facilitated by its activity.
d) Retardness may be caused due to its deficiency.
e) Its deficiency may cause bleeding from the gums or other parts of body.
f) Its deficiency delays the healing of wounds.
g) Its sources are oranges, grapefruits, peaches, guava, lemons and green chillies.

4. What are energy requirements of our body? How much energy is provided by different foods?

Ans:

Energy Requirements:

Energy requirements of person depend on many factors like: Age, Sex, Daily work, Female's pregnancy period, Occupation etc.

While deciding for the energy requirements of person following points should be kept in mind:

a) Energy requirements vary from person to person.
b) Females need less energy than males.
c) Energy required per kg body weight is more in case of growing children.
d) Pregnant mothers need more energy.

e) People engaged in such occupation that involved great labourious work need more energy. If they eat less they loss their body weight.

f) People with less hard and comfortable life need less energy. If they eat more they increase their body weight, which is not good for health.

g) Human community living in the colder areas needs more energy because they have to overcome the low temperature as well through the production of thermal energy.

h) People take less diet in summer as compared to winter.

Table for the energy requirements of different people are given below:

Groups	Age in Years	Calories per Day
Children	1-3 4-6 7-10 11-12	1200 1600 2000 2500
Girls	1-13 14-20	2600 2800
Women	No work Light work Hard work	2200 2500 3000
Men	No work Light work Hard work	2500 3000 4200

Energy provided by foods:

The amount of energy provided by different types of foods depends upon its composition. Different food components provide different energies to our body.

The energy providing food components are carbohydrates, proteins and fats. Their energy levels are given in the following table:

Food Component (one gram)	Energy in Calories
Carbohydrates	4.1

Proteins	4.1
Fats	8.3

There are different food sources each providing a certain amount of different food components. So their energy levels are also different.

The following table is showing energy levels of different food commodities:

Food (100 grams)	Calories
Wheat	348
Egg	180
Rice	348
Neat	194
Potatoes	100
Barley	355
Banana	155
Cucumber	14
Cow milk	70
Dry fruits	500
Buffalo milk	120
Brinjal	5

5. Define balanced diet. Why it is important in different people?

Ans: **Definition:** "A balanced diet refers to the daily food that contains all the components of food in proper amount and ratio".

Explanation: Every individual need balanced diet for the growth and development, proper functioning of body metabolism and to fulfill energy requirements of body. So different people have their own balanced diet tables and requirements.

Balanced Diet of Different People:

Babies: Milk is the best food for the newly born babies. Babies should be provided by their food according to a proper schedule.

Milk is the food of choice for the babies because it contains all the components of food. Among milk from different sources mother's milk should be provided to the babies during three months of baby's life. During this period solid food should not be provided to the babies.

A baby needs about 600-700 c.c. of milk per day.

As there is less capacity of the stomach of baby so he should be provided with milk each time whenever he feels hunger.

If mother's milk is not available then buffalo milk should be the second choice.

After four months of age some semi-solid food should be given to babies like sago, kheer, soap, bananas, eggs etc.

At the age of one year food like cereals, eggs porridge, fruits and such other solid food should be started.

Young People: They have different food requirements than babies.

The young people need more energy for growth, development, hard works, running, playing and other such physical activities.

As the energy requirements are more so they should take more carbohydrates, proteins and fats.

Those people in the growing age should taken more proteins because they require it for the building of body tissues. They also need more minerals and vitamins due to more metabolic activities.

During the age of 12-16 years special care should be taken because growth rate is very fast in this age and almost all the body changes occur. People of this age should be provided with minerals, fruits, yogurt, meat and milk.

Old People:

As the working capacity of body decrease during this stage so these people should be provided with the food with

less carbohydrates and fats.

They should be provided with the food that can easily be digested.

Their food should be milk, vegetables, fruits and other light forms of foods.

Feeding Mothers:

The pregnant mothers provide nourishment to developing baby so their food requirements are more.

Their food should contain healthy amounts of carbohydrates, proteins, vitamins and minerals.

The deficiency in food components during this stage may lead to some abnormality in the baby or weakness of mother and child.

Breast feeding mothers require at least one liter of milk along with proteins, calcium and phosphorous.

Commonly a pregnant mother should take meat, mil, eggs, fruits, vegetables, fats, cereals, bread and sugars.

6. What do you mean by coordination? Explain different systems of coordination.

Ans:

Coordination:

Definition: "Different body organs are integrated to each other through a system in such a way that all the body activities should take place smoothly. This system is called as coordination system".

Explanation: There are different organs in our body which perform different functions. All these activities of body have been integrated and organized in order to make them effective. So nature has provided our body with a system which organizes these activities.

Types of Coordinate Systems:

There are two distinct systems of coordination"

Nervous System:

Definition: "The coordinate system consisting of neurons

responsible for the transmission of messages in the form of nerve impulses from one part of body to other is called nervous system".

The property of this system is that it is direct and immediate. It is further divided into two types i.e.

a) Central Nervous System (CNS):

It consists of brain situated in the skull and spinal cord situated in the vertebral column. Every message taken from external or internal stimuli is first taken to this part and then transmitted to other sections of body.

b) Peripheral Nervous System:

All the nerves that originate from the CNS and spinal cord constitute peripheral nervous system. There are two types of these nerves:

- **Sensory Nerves:** These are the nerves that bring the messages from the receptor organs to CNS. The receptors are the organs that receive the stimuli from internal or external environment.
- **Motor Nerves:** These are the nerves that transmit the messages form CNS to the muscles or glands etc. for ultimate action.

Working of Nervous System:

There are some sense organs in our body like eyes, ears, nose, skin, tongue that are stimulated by the stimuli. The message from these is transmitted to CNS through sensory nerves. The message is then analysed here and sent to the effectors like muscles and glands through motor nerves immediately. The ultimate result of this transmission might be the feeling of pain, heat, cold, odour, smell and taste.

Phenomena of Pain:

In case of any pain message is transmitted from the area of injury through sensory nerves to brain where it is examined and an immediate message is sent to the effectors in the injured area. As a result we feel pain.

Endocrine System:

"It is the coordinate system which is controlled through hormones secreted by specialized glands called endocrine glands".

Explanation:

It is also called as Hormonal System. There are many glands present in our body. These glands are also called as ductless glands because they are not connected through their own ducts. The secretions of these glands are transmitted through blood. Two properties of this system are important:

- It is an indirect system of coordination.
- In this system coordination is slow.

Important Endocrine Glands of human are:

Thyroid Gland:

a) It is present on both sides of the middle of neck.
b) Deficiency of iodine causes a disease "Goiter" in which size of the gland increases enormously.
c) Goitre is common in the Northern area of Pakistan.
d) The hormone secreted by this gland regulates rate of growth and metabolism.

Parathyroid Gland:

a) These are four glands which are present near to the Thyroid gland.
b) Amount of calcium in blood and bones is controlled by the activity of the hormone of this gland.
c) Tension in muscles is caused by the deficiency of its secretion due to reduction in the level of calcium in blood.

Adrenal Gland:

a) They are present at the top of both kidneys.
b) They produce several hormones.
c) Its function is to stand by in case of emergency or shock to the body.
d) It helps to increase the body metabolism and activity in case of emergency by increasing the heart beat and

general body metabolism.
e) Laziness is caused by its deficiency.

Pituitary Gland:

a) This gland is the most important because it controls the activities of other glands.
b) It is situated at the lower part of brain.
c) It secretes many hormones that either control the activities of other glands or regulate the growth and functioning of the body.
d) Due to its wide range of functions it is also called as "Master Gland".

Pancreas:

a) It is situated near to the small intestine.
b) There is small area of pancreas that act as gland and secrete hormones.
c) It produces two hormones i.e. Insulin and Glucagon.
d) Insulin converts glucoses into glycogen thus reducing its concentration in the blood.
e) Glucagon converts glycogen into glucose thus increasing its concentration in the blood.
f) There is a disease called Diabetes, which is caused by the deficiency of insulin in blood.

Ovaries and Testes:

a) Ovaries are present in females while testes are present in males.
b) These organs also produce sex hormones in addition to the production of gamets.
c) The sex hormones give secondary sex characters to the body and control the sex functions.

7. What are different stages of life? Describe the process of aging?

Ans: There are many stages through which a man passes.

Stages of Life:

1. Infant Stage:

It is the stage of life when the mother feeds child. The growth rate at this stage is maximum. The cells are most

active and reproduce at very fast rate.

2. **Child Stage:**

The growth rate is again very fast. The metabolic activities are very fast at this stage.

3. **Adolescence Stage:**

The metabolic activities are still at their peak. There are many hormonal activities at this stage.

5. **Young Stage:**

There is constant rate of metabolism at this stage. The growth is approximately stopped and degeneration of the cells starts. Process of degeneration of cells start after the age of thirty years.

6. **Old Stage:**

The process of degeneration is enhanced. All the metabolic activities are slowed down.

Aging:

Definition: "The natural process in which body cells start to be inactive and degenerated in the old years of life is called aging".

Features of Aging:

a) Aging is a natural process, which is associated to each living cell.
b) The process of aging involves physiological changes.
c) Cells become inactive and sluggish due to the accumulation and deposition of wastes in the cells.
d) It is a slow and gradual process.
e) Every organ is aged but their time of aging varies. For example Thymus gland becomes complete in the age of 10-12 years. After this age start shrinking and becomes half by the age of 20.
f) At the age of 14, reproductive organs start to develop.
g) Muscles are completely developed by the age of thirty years.
h) The aging of bones start in the late years almost after 60 years.
i) Nervous system remains working till the last days of life.

Role of Blood Vessels in Aging:

There is a significant role of blood vessels in the process of aging of cells. Due to the deposition of calcium in the muscles of heart and blood vessels, they become inelastic leading to high blood pressure. This causes enlargement of heart. This leads to many problems.

Less Resistance of Body:

The process of aging lead to some physiological changes due to which body becomes weak and its ability to withstand environmental stress and diseases becomes less. Body becomes less resistive to the seasonal hazards.

Aging as Inheritance:

It is believed that genes control the process of aging and it is programmed in the DNA of each cell of the organism.

The process of aging starts at the molecular level, then proceeds to cellular, tissue, organ and finally to the organism level.

Continuous Aging:

There are enormous activities, which are being taking place inside the cells. These activities involve many biochemical changes. During the performance of these activities the cells become tired, exhausted and fatigued. Their efficiency and capability of working is decreased. As a result the new cells replace these old cells.

Examples:

a) One of the examples is the regular replacement of the internal lining of blood vessels.
b) The red blood cells are decomposed and new cells are continuously being made in the bone marrow cells.

Consequences of Aging:

- The destructive processes are enhanced as compared to the constructive processes.
- The strength of body is decreased.
- Body becomes less resistant to diseases.

- Vital organs such as kidneys, heart, liver etc. are adversely affected, stop working at one stage and lead to the death of the person.
- Nervous system becomes functionless.
- All biochemical activities are stopped at time of death.

8. What do you mean by hygienic conditions? What we should do to maintain hygienic conditions?

Ans:

Hygiene:

"It means to keep our whole environment including homes, offices, water and food clean and free of all un-necessary micro-organisms".

Explanation:

There are many basic principles of hygiene, which are changing day by day according to the changing conditions. So we should adopt all of these upto date principles. It involves:

- Keeping environment clean.
- Washing our hands before eating, after toilet usage.
- Teeth to be cleaned twice a day.
- Trimming of nails.
- Regular bathing.
- Avoiding eating rotten fruits and other food materials.
- Ironing kills the germs so clothes should be ironed.

Importance of hygiene:

Fresh Air:

- Houses should be ventilated properly. This is because oxygen is needed for the process of respiration.
- All the rooms including kitchen should be properly lightened. This is because light is essential for the killing of microbes.

Water and Food:

- These two are the main sources of germs.
- Contaminated water causes many diseases.
- To avoid water-spreading diseases, water should be boiled to kill the microbes.

- Proper cooking is also essential for killing of pathogens present in food.
- Proper preservation of food also prevents many diseases.
- Food with bad smell or changed taste should not be eaten.
- Cooked food kept in refrigerator for a long time should not be consumed.
- To prevent food poisoning fresh food should be utilized.

Garbage and Wastes:

- Proper deposition of wastes and garbage of houses is essential.
- A covered basket should be used for keeping these wastes.
- All the garbage should be deposited in the garbage centre and should not be kept for long time in the house.

9. Why regular exercise is important for proper health?

Ans: Every person should do exercise daily at least for fifteen minutes in order to keep himself healthy. It is said that only a healthy body bears a healthy mind. So a slight effort of exercise like brisk walking or slight jogging may give us many benefits both physical and mental. So it is rightly said that exercise is the key to good health.

Benefits of Exercise:

- Keeping heart healthy active and strong.
- Proper blood circulation in the body.
- Skin remains healthy and skin pores are opened due to sweating.
- Regulation of oxygen supplies process.
- Muscles of body become strong and active.
- Kidney working is improved.
- Improvement of digestive system and more appetite.

Exercise and Obesity:

During exercise the extra fats that are accumulated as a result of heavy intake of food are burnt. Otherwise this fat and

obesity would lead to inactive and lethargic conditions of body. Due the burning of extra fats, body becomes active and healthy.

- This process reduces the hazards of diseases, paralysis and diabetes.

10. Why rest and sleep is necessary? Give importance of prayers.

Ans:

Rest and Sleep:

For keeping ourselves mentally and physically fit we have to provide our body with proper rest and sleep. It is importance for keeping us vigorous.

Prayers:

Saying five prayers in a day is such a unique activity, which is, blessed us by Allah Almighty that gives many physical, mental and spiritual benefits. Some of these are given as:

Benefits of Prayers:

a) By saying prayers we submit ourselves to Allah Almighty. This gives us spiritual satisfaction.

b) The performance of this duty diminishes the aimlessness of life, which is most common in people of this age.

c) It gives us a chance to wash our hands, face, arms and feet five times a day.

d) It insists to wear clean clothes.

e) It keeps us away form social evils

f) It provides us a chance of physical exercise.

11. What do you mean by first aid? What are its principles and what immediate steps should be taken in some of the common cases of misshape?

Ans:

First Aid:

"It refers to the help which is provided by the aider to the persons injured or to whom emergency or mishap had occurred before the treatment provided at hospital".

Explanation: Our lives remain in huge danger every time especially when we are on the road dealing with electricity or exposed to the germs or beasts in some jungle. This makes the accidents and mishaps a part of our lives. Those persons who have excess to the injured people should not panic and try to help the injured persons out. This involves some principles, which should be followed.

Principles of First Aid:

a) To restore airway (respiratory tract).

b) To restore breathing (inhalation and exhalation).

c) To restore circulation (Blood circulation).

A person might face different types of emergencies:

Accidents:

Following immediate steps should be taken in this case.

Steps:

a) Patient should be shifted to some safer area under shade.

b) Condition of patient should be assessed immediately. This is done to decide the steps to be taken.

c) According the principles airway, breathing and circulation should be checked.

d) Stop the bleeding if any.

e) A splint should be used to stabilize the fractures if any.

f) Patient should be transported to the nearest medical centre as quickly as possible.

Snake Bite:

The snakebites cause pain, illness or death due the venom, which is injected into the body of patient by the snake.

Steps:

a) **Snake Identification:** Snake should be killed and carried to the medical staff so that it should be identified and proper anti-venom should be given to the patient.

b) **Washing and Covering Wound:** The wound should be washed and covered. A broad bandage or cloth strip should be placed just above the wound and fixed firmly.

c) **Immobilization:** The affected limb should be immobilized to stop the circulation of blood. so that venom does not spread in the body.

d) **Approach to Hospital:** The person should be shifted to the nearest hospital.

Dog Bite:

In case of bite of dog the blood of the patient should be tested for any pathogenic micro-organism that might be present at animal's teeth or saliva.

Steps:

a) Serious bleeding should be controlled by the application of direct pressure.
b) Wound should be covered with sterile dressing or some cloth.
c) It should be assessed that whether the patient undergo a shock or not.
d) He should be shifted to the hospital.

Heart Attack:

It is a very serious situation, which might be fatal and is very common now a days.

Steps:

a) Any visible obstruction from mouth should be removed.

b) Two fingers should be placed near the chin and the jaws should be raised. Pressure should be applied on the forehead to tilt the head well back.
c) Movements of chest and abdomen should be checked

for knowing that the patient is breathing or not.

d) Pulse should be checked.
e) The patient should be brought to the hospital if breathing and pulse is present.

Cardio-Pulmonary Resuscitation:

It is the procedure to manage artificial respiration and chest compression. It is followed in case of heart attack if the patient is not breathing or pulse is not there.

Steps:

a) **Search for Sternum:** Patient should be laid down from back on some firm surface and the point should be searched out where the lower ribs meet in the center. This is the lower part of sternum.
b) **Positioning of Fingers:** Left hand should be placed on the top of your right hand interlocking the fingers, on sternum. The fingers should be pulled up so that the palm of your right hand is the only part, which is in the direct contact with breastbone.
c) **Applying Pressure:** The arms should not be bended at this stage. Lean over the patient and apply pressure on the sternum four to five centimeters approximately eighty times per minute.
d) **Method to be followed by a Single Person:** A single person most easily performs 15 chest compressions followed by two breaths of artificial respiration through mouth.
e) **Duration of Process:** This process should be continued until the patient start breathing.

Solved Exercises of Text Book

1. Complete the following statements:

i) Plants manufacture their foods by the process of __________.

ii) Cotton fibres are actually a carbohydrate called __________.

iii) Vitamin A is essential for health and ___________.
iv) Vitamin C is also known as ___________.
v) The number of calories in 100 grams of potatoes is ___________.

Answers:

i)	ii)	iii)	iv)	v)
photosynthesis	cellulose	growth	ascorbic acid	100

2. Tick (✓) the following statements either True or False:

i)	One gram of each carbohydrates and fats will release the same amount of energy.	False
ii)	Vitamin B1 is known as riboflavin.	False
iii)	Thyroid glands are present near the kidneys.	False
iv)	Pancreas produces enzymes as well as hormones.	True
v)	Vitamin D is water-soluble.	False

3. Encircle one choice a, b, c or d in each case.

i) Out of following vitamins which is associated with the clotting of blood.

a) Vitamin A
b) Vitamin B
c) Vitamin E
d) Vitamin K

Ans: Vitamin K

ii) How much energy will be released from one gram of proteins.

a) 3.1 Calories
b) 4.1 Calories
c) 6.1 Calories
d) 8.1 Calories

Ans: 4.1 Calories

iii) How much calories are present in 100 grams of potatoes.

a) 50 Calories
b) 70 Calories
c) 80 Calories
d) 100 Calories

Ans: 100 Calories

iv) All the following types of food provide energy except.

a) Potato b) Milk
c) Egg d) Water

Ans: Water

v) Semi solid food should be started to the babies after the age of.

a) 3 months b) 4 months
c) 5 months d) 6 months

Ans: 6 months

4. What are the main components of human food? Explain with their sources.

Ans: See Q. No. 2 for answer.

5. Explain water-soluble vitamins i.e. B and C.

Ans: See part two of Q. No. 4 for answer.

6. Write a note on balance diet.

Ans: See Q. No. 5 for answer.

7. Explain the endocrine glands of man with their functions.

Ans: See part two of Q. No. 6 for answer.

8. What are the basic principles of first aid?

Ans: See Q. No. 11 for answer.

Section-III

Short Questions with Answers

1. Why we eat food?

Ans: We eat food to carry out our body functions that may be conscious performed like walking, running, playing or crying, or they may be unconsciously performed like heart beat, movement of kidneys or blood vessels. We also need food to keep our body warm.

2. What are the energy food components?

Ans: Energy food components are those which provide energy to the body. These components are carbohydrates and

fats. In case of unavailability of carbohydrates and fats, proteins also provide energy.

3. What is the role of minerals in our body?

Ans: Minerals are mainly used for the regulation of body metabolism. For example many mineral elements act as co-factors of different enzymes that facilitate a chemical reaction.

4. Why body builders are advised to take more proteins?

Ans: The body builders are required to build their body muscles. Proteins are the components of food which are used up for the formation of body muscles and other body tissues therefore such people are advised to take more proteins as compared to other food components.

5. Humans and animals start dying due to heat in hot summer in some countries. Why?

Ans: Because of high temperature, the enzymes, which are working in the animal's body, start to be degenerated. This leads to the disturbance of normal body metabolism causing animal to die.

6. Why more food is taken in winter?

Ans: In winter season, more food is required. This is because we need more energy to moderate our body temperature which we get by the consumption of food.

6. A large number of proteins are formed form a few amino acids. How?

Ans: This is because in each protein there arrangement is different. This difference in arrangement creates the possibility of the formation of more proteins from less amino acids.

7. What are higher carbohydrates?

Ans: Higher carbohydrates are those which are the long chain polymers of small glucose units. These include starch, cellulose, glycogen etc.

8. How water chemically participates in the process of digestion?

Ans: During the process of digestion, water is required for the hydrolysis of long chain carbohydrates to convert them into simple sugars. Water is used up in this reaction as a reactant.

9. Plant sources of protein are mostly legumes. Why?

Ans: Legumes are the crops that contain nitrogen-fixing bacteria in their roots. These bacteria fix nitrogen by converting it into the absorbable form to plants. The nitrogen thus fixed is used up for the formation of proteins. Therefore these plants have more amount of protein in them.

10. Why our body requires proteins?

Ans: Our body required proteins for the formation of different body tissues and secretions like the muscles, lining of different vessels, enzymes, antibodies etc.

11. Sugar and wheat both provide glucose but we get wheat for this purpose. Why?

Ans: Wheat provides glucose along with some other food components like minerals and vitamins which also required by our body for normal functioning. On the other hand sugar (sucrose) only provides glucose.

12. Fats provide more energy as compared to carbohydrates and proteins. Why we do not use them?

Ans: It is a fact that fats provide more energy but if they are consumed in large amount, they cause heart problems. In economic point of view fats are more costly as compared to other energy components of food.

13. What is the difference between fats, oils and lipids?

Ans: Fats are mostly referred as the solid while oils as liquid part of this component of food and both of these along with some other forms like steroids are collectively called as lipids.

14. What is the relation between diabetes and insulin?

Ans: Insulin is a protein produced found in blood. It causes the conversion of extra glucose into glycogen. In its deficiency extra glucose remains as such. This condition is called diabetes.

15. Name some of the most important mineral elements required by our body.

Ans: The most important mineral elements required by our body are calcium, magnesium, iron, phosphorous, sodium, potassium, chlorine, fluorine, sulphur, cobalt, copper etc.

16. Why it is important to eat citrus fruits to keep our gums and teeth healthy?

Ans: The citrus fruits are the rich sources of ascorbic acid or vitamin C. This vitamin is important for keeping our gums and teeth healthy.

17. More water is consumed during hot weather. Why?

Ans: In hot weather water is required by the body is regulate the body temperature. During sweating more and more water evaporates from the body surface after absorbing heat. This produces cooling effect.

18. People of teen ages have more food requirements as compared to others. Why?

Ans: The young people have more food requirements because all of their body functions are at the peak. Their body growth is fast and more body tissues are being made. They have maximum cellular metabolism. These processes need energy, which is provided through food.

19. Newly born baby is provided with milk after very short intervals. Why?

Ans: The newly born babies have very less stomach capacity. They can have very less milk at a time. So they are provided with small amount of milk after short intervals.

20. Why breast-feeding of babies is recommended by the scientists?

Ans: The breast-feeding of the newly born babies is

recommended because nature has kept many antibodies in the mother's milk for the safety of delicate body of the child against a variety of disease germs.

21. Why pregnant mothers need more food?

Ans: Pregnant mothers need more food because firstly they have to develop a complete body of the baby with all the required body tissues that requires proteins and secondly they have to fulfill the energy requirements of the developing baby. This needs a consumption of carbohydrates, vitamins and minerals.

22. The endocrine system of coordination is ductless then how message is transmitted to the required parts of body?

Ans: Endocrine system of communication is a system of coordination in which the particular different body parts are coordinated through glandular secretions which are transmitted to the target body parts through the blood circulatory system.

23. What is a nerve impulse?

Ans: A nerve impulse is the physical form of message in which it is transmitted from one nerve to the other and finally to target neurons in the muscles, glands etc.

24. What is the function of central nervous system?

Ans: The central nervous system receives the message from sensory neurons and then give do analysis. Then the orders are sent by the central nervous system to the motor neurons that carry these orders to target body parts that act accordingly.

25. What is the function of sensory neurons?

Ans: The sensory neurons present in the sense organs are affected by the internal or external stimuli and send a message in the form of nerve impulse to the central nervous systems. The neurons are present in eyes, nose, skin, ears and tongue etc.

26. What are the motor neurons?

Ans: The motor neurons are the nerve cells that transmit the

orders from central nervous system to the effectors. These are the neurons that keep a contact between the central nervous system and body tissues like muscles and glands.

27. What is the role of glucagon in our body?

Ans: Glucagon is a hormone present in the blood. It converts the glycogen back into glucose whenever there is requirement. This hormone is produced by pancreas.

28. Why pituitary gland is called as "Master Gland"?

Ans: The pituitary gland is called as master gland because in addition to its participations in the body functions directly, its secretions also control the functions of many other gland secretions.

29. How ovaries and testis act as glands?

Ans: The primary function of ovaries and testis is the formation of gametes but they also secrete some hormones that provide secondary sex characters to the males and females.

30. Why there is constant rate of metabolism in the young ages?

Ans: In the young ages maximum growth has been done and cells start to be degenerated. Therefore the metabolism rate tends to be constant and be performed at optimum level.

31. Why aging cannot be controlled?

Ans: The aging cannot be controlled because like other body characters aging is also coded in the genetic material of each and every body cell. Therefore all of these cells have to be degenerated with the passage of time.

32. How aging takes place?

Ans: The process of aging starts at molecular level causing the important molecules to degenerate then cells, organs, organs systems and finally the whole body is effected causing them to be less efficient.

33. How process of aging can be reduced by exercise?

Ans: The exercise causes all the body muscles to stretch which keeps them working to the maximum possible level. No exercise causes them to be inactive, more fatigue, tiredness and thus degenerated.

34. Why proper heating of food is important?

Ans: The food material is a very important source of diseases. So the heating of the food is done to kills the parasites especially microscopic germs of diseases.

35. Why blood circulation is minimized in case of a snake's bite

Ans: In case of a snake's bite its venom (poison) is shifted to the blood circulation system of the body. Now this circulatory can spread it to the whole of the body. This spread of venom is controlled by least blood circulation.

36. How blood circulation can be minimized in case of a snake's bite?

Ans: The blood circulation is case of snake's bite can be minimized by the application of a broad band or cloth above the injury point. The minimum movement of the effected limb can also reduce it.

37. In which conditions Cardio-Pulmonary Resuscitation is necessary?

Ans: The Cardio-Pulmonary Resuscitation is necessary in case when breathing and pulse of the patient is not present.

38. Why proper growth and strength of the bones is associated to the proper level of vitamin D"

Ans: Vitamin D is very important for the proper utilization of calcium and phosphorous. As the growth and strength of bones is dependent on the proper utilization of these two elements so the growth and strength of bones indirectly depends on vitamin D supply.

Section-IV

[illegible]

a) Chose the most appropriate choice:

1. Energy is needed to keep our body:

a) Warm b) Healthy
c) Strong d) Fresh

2. Our food is a source of:

a) Energy b) Minerals
c) All of above d) None of above

3. The energy released during break down is taken up by special energy transferring compounds called:

a) CPR b) ATP
c) ADP d) DNA

4. Food provides the raw materials for:

a) Growth b) Development
c) Strength d) All of above

5. During respiration glucose is burnt to release:

a) Water b) Energy
c) Secretions d) Food

6. During digestion the starch is converted in to its basic unit:

a) Fatty acid b) Glucose
c) Glycerol d) Amino acid

7. Protein molecules are of much:

a) Lesser reaction b) Smaller size
c) Greater reaction d) Larger size

8. Amino acids are diffused in to:

a) Cells b) Lymph
c) Organds d) Blood

9. Shortage of Insulin cusses common disease called:
a) Diabetes b) Anaemia
c) Goitre d) Hepatitis

10. Fats have double amount of energy as compared to:
a) Carbohydrates b) Proteins
c) Other sources d) All of above

11. Vitamins are divided in to two main groups on the basis of their:
a) Reactivity b) Structure
c) Chemical nature d) Solubility

12. Vitamin A, D, E and K are soluble in:
a) Water b) Fats
c) Liquids d) Proteins

13. Our body produces vitamin____ in sunlight.
a) C b) D
c) B d) K

14. Vitamin E is needed for the formal functioning of ____ system.
a) Nervous b) Coordinate
c) Circulatory d) Excretory

15. Vitamin B complex includes about______ vitamins.
a) 6 b) 5
c) 12 d) 10

16. ______Vitamin is also called Thiamin.
a) B_{12} b) B_6
c) B_1 d) None of above

17. ______Vitamin helps in the process of digestion and assimilation of proteins.
a) B_6 b) B_{12}
c) B_1 d) B_2

18. In the absence of vitamin B_2 _____food does not become part of body.
a) Absorbed b) Assimilated
c) All of above d) Digested

19. ______Vitamins also called cyanocobatamin.
a) C b) K
c) B complex d) B_{12}

20. The energy requirements vary from:
a) Situation to situation b) Individual to individual
c) All of above d) None of above

21. The pregnant mothers need_______ energy:
a) More b) Additional
c) Extra d) All of above

22. Persons having ______life need less energy:
a) Busy b) Fatigued
c) Hard d) Comfortable

23. A diet that contains at components of food in proper ratio for proper growth and maintenance of heath of body is called:
a) Good b) Balanced
c) Nutritious d) Proper

24. In the first _______months the baby should be bed on mother's milk.
a) 2 b) 4
c) 5 d) 3

25. _____ system is composed of nerve cells.
a) Circulatory b) Coordinate
c) Sensory d) Nervous

26. In old ages working capacity of body is:
a) Decreased b) Maximum
c) Increased d) Optimum

27. A baby needs 600 to 700 c.c. of milk per:
a) Day b) Month
c) Year d) Week

28. Every message is first taken to:
a) Sensory organs b) CNS
c) Blood d) Spinal cord

29. **Stimuli are received by the receptors in the_____ organs.**
a) All organs b) Visceral
c) Main d) Sensory

30. **Endocrine glands secrete some chemicals called:**
a) Impulses b) Enzymes
c) Secretion d) Hormones

31. **Endocrine glands are also called______ glands.**
a) Coordinate b) Veinless
c) Ductless d) Nervous

32. **Hormones pass directly into:**
a) Lymph b) Cells
c) Tissues d) Blood

33. **Endocrine system is also called______ system.**
a) Secretory b) Hormonal
c) Perfect d) Coordinate

34. **Our food must contain some iodine otherwise these glands become large and cause a disease called:**
a) Diabetes b) Goitre
c) Heart attack d) Beri Beri

35. **Hormone of ______ gland shortage leads to laziness.**
a) Pituitary b) Thyroid
c) Adrenal d) Parathyroid

36. **Pituitary gland secrete several:**
a) Vitamins b) Minerals
c) Proteins d) Hormones

37. **The _____ gland is called as Master gland of the body.**
a) Adrenal b) Pituitary
c) Testis d) Pancreatic

38. **Pancreas produces two hormones i.e. Insulin and:**
a) Thyroxin b) Goitre
c) Secretion d) Glycagon

39. Shortage of ____ causes a dangerous disease called:

a) Glycagon b) Proteins
c) Insulin d) Cellulase

40. Shortage of _____ of parathyroid gland reduces level of calcium in the blood.

a) Availability b) Secretion
c) Hormone d) Mineral

Answers:

1. a	11. d	21. d	31. c
2. c	12. b	22. d	32. d
3. b	13. b	23. b	33. b
4. d	14. a	24. d	34. b
5. b	15. d	25. d	35. c
6. b	16. c	26. a	36. d
7. d	17. d	27. a	37. b
8. d	18. d	28. b	38. d
9. a	19. d	29. d	39. c
10. d	20. c	30. d	40. c

Fill in the blanks and True or False questions are not included in the examination paper. However the same are being given for Memory Test of students.

a. Fill in the blanks:

1. The food acts as ______for the human body.
2. Food provides the ______for the growth and repair of the body.
3. The simplest carbohydrate is ______.
4. The basic unit of all other forms of ______is glucose.

5. During digestion _____ is converted in to its basic unit glucose.
6. The number of amino acids ranges from _____ to _____.
7. During digestion large molecules of proteins are broken down in to _____.
8. Enzymes are also _____.
9. All types of fats i.e. ghee, oil, butter etc. are collectively called _____.
10. Vitamins are divided into_____ main groups on the basis of their_____.
11. Vitamin _____ is essential for the growth of body, particular in children.
12. Vitamin _____ is essential for the growth of body, particularly in children.
13. The deficiency of vitamin A may cause_____.
14. Vitamin_____ helps the body in consuming calcium and phosphorous.
15. Deficiency of vitamin D may cause weakness of _____.
16. Vitamin E is important for normal working of _____.
17. In the absence of vitamin E, the vitamin _____ and _____ cannot work properly.
18. Vitamin K helps in_____ of blood in case of injury.
19. In case of absence of vitamin K blood fails to _____ properly.
20. Vitamins _____ and _____ are water-soluble.
21. Vitamin B is also called_____.
22. Deficiency of vitamin B_1 may cause a disease called_____.
23. Vitamin B_2 is also called _____.
24. Vitamin B_2 helps in the process of _____ and assimilation of _____.
25. Vitamin B_{12} is also called _____.
26. Deficiency of vitamin B_{12} may cause_____.
27. Vitamin C is also called _____.

28. Vitamin C keeps _____ and______ healthy.
29. _______ is a the best solvent.
30. A young male needs more ______ than females.
31. In newly born babies _____ is the only proper diet.
32. A baby needs ___ to ____ c.c. of milk per day.
33. The growth rate is faster between ____to _____ of human life.
34. In old age working ______ of the body decreases.
35. Nervous system is composed of nerve cells called_____.
36. The nervous system can be differentiated into ____ systems.
37. _____and ____ from the central nervous system.
38. The endocrine system is also called______.
39. Goitre disease is a common in the _____ areas of Pakistan.
40. The pituitary gland is also called ______ of the body.
41. The shortage of insulin causes a dangerous disease______.
42. In the ____ one is having a constant rate of metabolism.
43. The process of degeneration starts at the age of _____.
44. The reproductive organs start growing at the age of ____ and above.
45. The cells of the body do not remain______ forever.

Answers:

1.	fuels	24.	digestion, proteins
2.	raw materials	25.	cyanocobatamin
3.	glucose	26.	pernicious anaemia
4.	carbohydrates	27.	ascorbic acid
5.	starch	28.	gums, teeth
6.	30,3000	29.	water
7.	amino acid	30.	energy
8.	proteins	31.	milk
9.	lipids	32.	600, 700
10.	glycerol, fatty acids	33.	12, 16
11.	two, soluble	34.	capacity

12.	A	35.	neurons
13.	might	36.	two
14.	D	37.	brain, spinal cord
15.	bones	38.	hormonal system
16.	nervous	39.	Northern
17.	A, C	40.	Master Gland
18.	coagulation	41.	Diabetes
19.	clot	42.	young stage
20.	B, C	43.	30
21.	thiamin	44.	14
22.	Beri Beri	45.	young
23.			

b) *Indicate the True/ False Statements:*

1. ATP stands for Amino Triphosphate.
2. The total number of amino acids rages from 300-3000.
3. Wheat is a good source of proteins.
4. Glycogen is called as plants starch.
5. Sucrose is also called as cane sugar.
6. The pulses are good sources of proteins.
7. Cotton is used to extract starch.
8. Our food has five components.
9. Water is also a component of food.
10. Large protein molecules are broken down into amino acids during digestion process.
11. Sucrose is the simplest form of carbohydrates.
12. Fats are used to form the bulk of the body.
13. All the oils, ghee, lipids and butter are collectively called fats.
14. Fatty acids and glycerol are the final digestion products of fats.
15. Minerals are the compounds used to regulate the body metabolism.
16. Vitamin A is readily soluble in water.
17. A disease called Beri Beri is caused by the deficiency of vitamin K.
18. 80% of our body is made up of water.

19. Our nervous system has three sub-systems.
20. Central system consists of brain and spinal cord.
21. Newly born babies should be provided with cow milk.
22. The pituitary gland present in the neck is also called "Master Gland".

Answers:

1. False	9. True	17. False
2. True	10. True	18. False
3. False	11. False	19. False
4. False	12. False	20. True
5. True	13. False	21. False
6. True	14. True	22. False
7. False	15. False	
8. False	16. False	

6 Environment and Natural Resources

Section-I

Introduction to Chapter

Contents: This chapter deals with the following topics.

- Atmosphere And Its Composition.
- Layers Of Atmosphere.
- Ozone, Its Importance, Depletion, Effects And Sources.
- Green House Effect.
- Radiations Of Sun And Their Distribution On Earth.
- Pollution And Human Activities.
- Water, Air, Land And Solid Pollution.
- Causes And Methods To Reduce Pollution.
- Fossil Resources.
- Minerals Obtained At Different Places In Pakistan.
- Resource Conservation.
- Crops Of Pakistan.
- Dairy Industry.
- Wild Life, Ecosystem And Forests.
- Urbanization And Its After Effects.

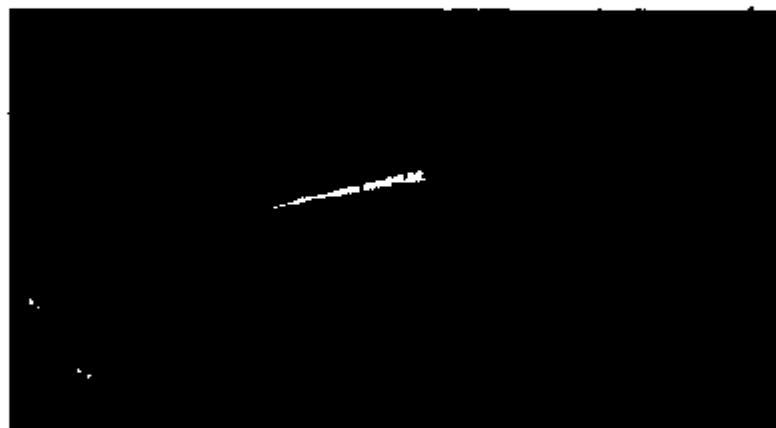
Section-II

Comprehensive Questions with Answers

1. What is atmosphere? Give its composition and layers.

Ans:

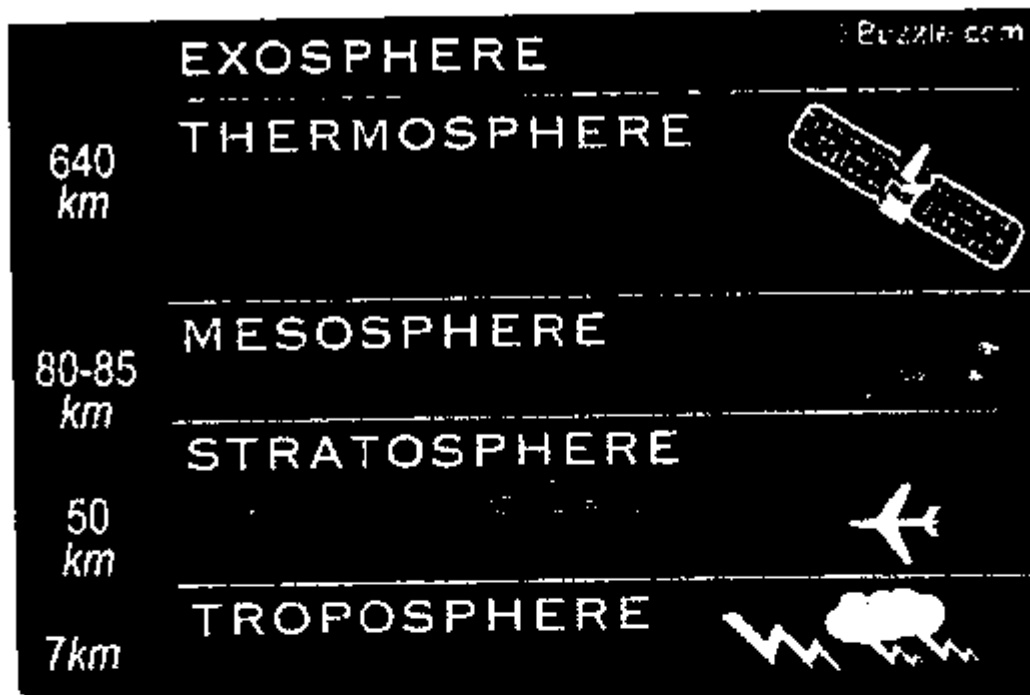
Atmosphere:

Definition: "The envelope of different gases surrounding the earth is called atmosphere".

Percentage of different gases in the Atmosphere

Composition of Atmosphere:

Gas	Percentage (%)
Nitrogen	78
Oxygen	21
Carbon dioxide	0.03
Argon	0.9
Liquid droplets/solid particles	Traces

Layers of Atmosphere:

There are four layers of atmosphere.

The height of various layers of Atmosphere

Troposphere:

a) Its height is 12 km from earth's surface.

b) It carries 80% of total mass of atmosphere.

c) Clouds and water vapours are present in this layer.

d) All the weather phenomena are carried out in this region.

Stratosphere:

a) It is extended upto 50 km from the surface of earth.

b) 99% of the mass of atmosphere is present in this area.

Mesosphere:

a) Its height is 80 km.

b) After this layer temperature start increasing.

Thermosphere:

It is extended upto 500 km from earth's surface.

The temperature of this region is very high. It is observed that the temperature in this area exceeds to 1000° C.

2. Write a note on Ozone layer.

Ans:

0332-5444532

Ozone Layer:

"Ozone is chemically a form of oxygen i.e. O_3 which is present in the form of layer in atmosphere".

Features of Ozone Layer:

a) This layer exits as above as 30 km from the surface of earth.

b) Ozone gas has pungent smell.

c) It provides shielding effect to all the life on earth against dangerous ultraviolet rays of sun.

d) This layer absorbs the ultraviolet rays.

e) The ultraviolet rays are damaging to human and other animal's skin, vegetables, textile and rubbers etc.

Depletion of Ozone:

a) There are some compounds like those of chlorine, fluorine and carbon called CFCs that are depleting the layer of ozone.

b) The ozone damaging compounds are used in spray cans, refrigerators, and air conditioners.

c) These gases are released into the atmosphere and cause damage to the ozone layer.

Effects:

a) The depletion in the ozone layer causes caner diseases especially of skin.

b) It affects the crops adversely.

c) It causes unusual changes in the climate.

d) It will increase the sea level upto one to four meters. This will cause the wastage of land.

e) It is causing the global warming.

f) It will cause the melting of ice on glaciers.

Ozone Layer Protection:

a) Protection of ozone layer is necessary for the protection of life on earth.

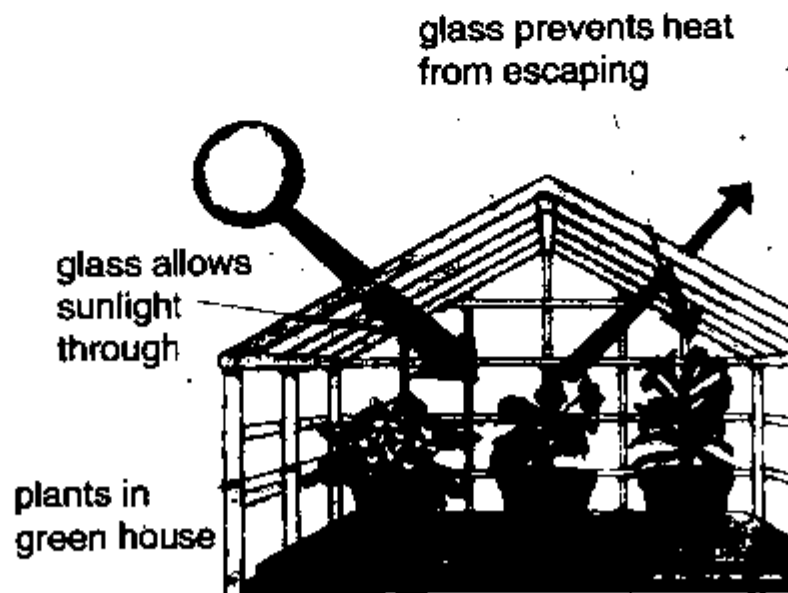
b) To protect the ozone layer it is important to decrease the production of carbon dioxide and other wastes.

3. What is green house effect?

Ans:

Green House Effect:

Definition: "The phenomena in which the atmospheric gases like carbon dioxide, ozone and water vapours act like the glass or plastic of green house in the maintaining of the temperature is called green house effect".

Explanation: The glass or plastic of green house intercepts the radiations reflecting from the surface of earth or plants kept in the nursery, thus increasing the temperature. The gases of atmosphere do the same duty. These gases intercept the radiations that are reflected from the surface of earth and now try to escape back to the space. As a result of this interception, the temperature of the earth remains suitable for the life on earth.

Green House Effect

Advantages:

a) One advantage of these phenomena is that the gases intercept the radiations coming from the sun at daytime, which does not allow temperature to increase to some value exceeding the maximum range, which is fatal for life.

b) Secondly the radiations being reflected from the earth's surface at night are intercepted so that temperature should not drop to much.

c) In the absence of this phenomenon the average temperature of earth would be –20°C which is now 15°C.

Human's Activities and Global Warming:

Main green house gas is carbon dioxide, which is being produced by humans, animals, vehicles, industries etc. at faster rate. The rate of their production is faster than the production of oxygen excreted during photosynthesis. This is increasing the percentage carbon dioxide in the atmosphere resulting in the increase of average temperature. It is called as global warming.

Effects on Global Warming:

This phenomenon is causing many problems like increase in the sea level, unusual changes in temperature etc.

4. What type of radiations are emitted from the sun? What is the fate of these radiations?

Ans:

Radiations of Sun:

Sun emits the radiations like radio, infrared, visible, Ultraviolet, X-rays, gamma rays etc. When these radiations approach earth these are absorbed at different stages.

Fate of Sun Radiations:

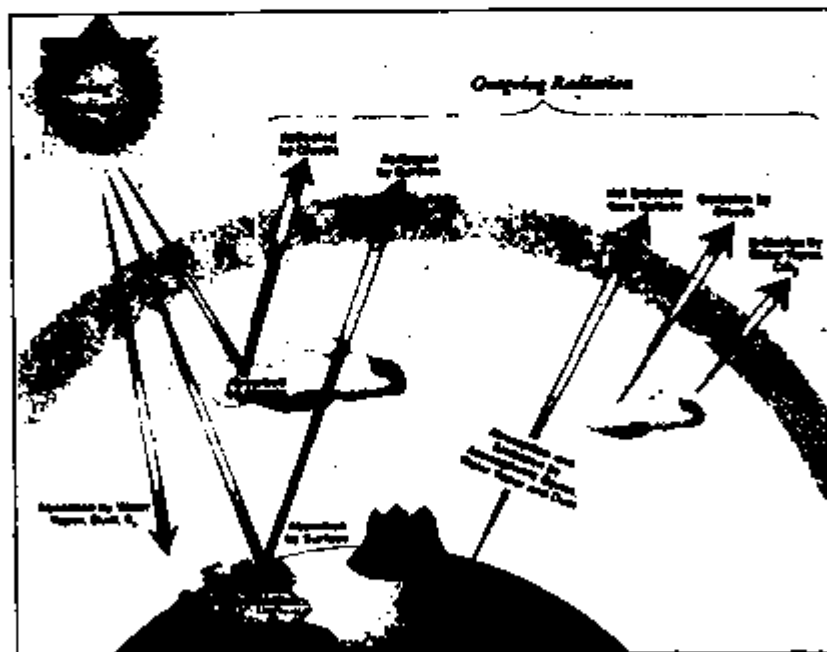
The radiations of sun split into three parts.

a) **Absorbed by Atmosphere:** It is one-fifth part of sun's radiations which are absorbed by atmosphere. The

radiations absorbed here are the ultraviolet rays. Ozone and oxygen gases absorb these.

b) **Reflection by Clouds:** One four part of the radiations is reflected by the clouds. This amount varies according to the density of clouds. Less light can pass through the clouds if they are thicker.

c) **Radiations Reaching Earth:** Less than one half of the radiations reach the surface of earth. Most of these radiations are absorbed at the surface and only a small portion is reflected again to the space.

d) **Total Reflection:** One third of the total sun radiations are reflected back to the space both by earth and atmosphere making sky blue. This refection is due to the scattering of visible light from dust particles and gas molecules.

Absorption of energy radiation in the Atmosphere

5. How human activities have disturbed the climate?

Ans:

Climate:

Definition: "The climate of an area is the long term weather condition of that area".

Explanation: There are different weather factors like temperature, humidity, rain fall etc. When all of these factors are recorded for as many as thirty years, the average value is called climate for that particular area. The climate of an area might be cold, dry or warm.

Problems Related to Climate:

a) Due to human activities the concentration of carbon dioxide is every day increasing. It is estimated that the level of this gas will become double in the coming years.
b) The increase in the concentration of carbon dioxide will result in an increase in the global temperature and ultimately melting of ice on glaciers.
c) Combustion of fuel in automobiles and industries are some of the very important causes of an increase in the carbon dioxide concentration in atmosphere.
d) Sulphur dioxide is another gas which is being put in the atmosphere. It not only deteriorates climate but also react with oxygen and water vapours and forms sulphuric acid that comes on earth long with rain. This phenomena is called acid rain.
e) The acid rains are dangerous for buildings, soil productivity, aquatic life and tender plants.
f) CFC gases are used in the refrigerators and air conditioners which are also released in the atmosphere damaging the ozone layer.
g) As the ozone layer is being damaged, it is causing great threat to life on earth. This is because the ultraviolet layers will not be stopped due to the thinning of ozone layer and these rays will damage the crops and other plants and trees that are the main components of all the life cycles.

So it is important that we should adopt such activities that the natural environment is least disturbed.

6. Define pollution. What are its different types?

Ans:

Pollution:

"Any undesirable change in the standard condition of

environment is called pollution".

Explanation: It is main problems of humanity in the recent days. Pollution may also be the addition of undesirable materials in the environment in addition to the unpleasant changes in the environment.

Types of Pollution:

Pollution has following types.

Air Pollution by Vehicles and Factories

Air Pollution:

Our air has been polluted due to the combustion of fossil fuels in automobiles, machines, factories and mills thus adding waste gases in the atmosphere. Important pollutants of air are:

a) **Smoke:** It includes the smoke and soot produced by the burning of fuel.

b) **Hazardous Gases:** These gases include carbon dioxide, nitrogen oxides, carbon mono-oxide, lead particles and sulphur dioxide.

Methods of Reduction in Air Pollution:

These methods include:

a) The fuels should be purified of all the impurities before their use.

b) Combustion of the fuels should be complete so that no soot or carbon mono-oxide is produced.

c) Checking the increase in the automobiles on road and increasing the plants through efficient plantation programmes can reduce carbon dioxide concentration.

Problems Associated to Air Pollution:

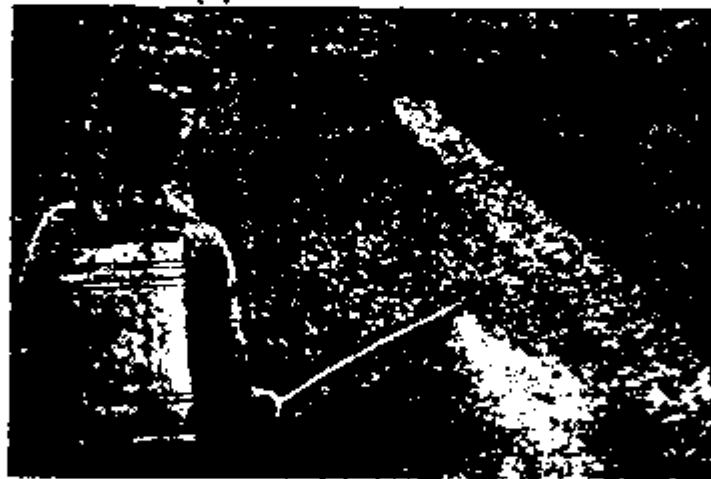
Air pollution causes headache, irritation of eyes, tension, anxiety and also damages lungs and nervous system.

Water Pollution:

As water is a universal solvent so it dissolves many minerals, compounds and salts making itself un-consumable. Such water is called polluted water.

Sources of Water Pollution:

Micro-organisms:

These are the germs of different diseases that mix with water from sewage. They include germs of dysentery, cholera and typhoid etc.

Pesticide is being sprayed

Agricultural Water Pollution:

a) There are many chemicals which are being used as fertilizer, pesticides in the field. These are poisonous to the living things. So their discriminate use should be discouraged.

b) The agricultural chemicals mix with the underground water by penetrating into the soil with rain.

c) When man or animals use this water for drinking purposes it caused many problems. If it is used in the agricultural production it still poisons the crop produce.

d) The animal wastes also become hazardous because they are just being thrown away into canals, rivers or streams

Industrial Water Pollution:

Industrial Waste Polluting the Water

a) Various wastes produced during the processing in industries, are thrown away into the open fields, rivers, streams, canals etc.
b) The industries do not have proper decomposition methods of these industrial wastes.
c) Industrial wastes contain many compounds like those of mercury, cadmium, arsenic, copper, lead, iron etc.
d) These compounds pollute the underground water.
e) It has been seen that the people in large industrial cities like Lahore, Karachi, Kasur, Faisalabad, Gujranwala etc. have to face a lot of health problems.

Domestic Water Pollution:

a) Main pollutants added from houses are detergents, plastic bags, broken glass jars, cans and organic wastes like paper etc.
b) Rapid growth of algae is caused by detergents. Oxygen concentration becomes very low when these algae die.
c) Aquatic life is affected due the shortage of oxygen supply.
d) Many water born diseases are caused by just throwing the house wastes into the water bodies.

Methods to Reduce Water Pollution:

a) **Decontamination of Drinking Water:** Drinking water sources should be saved from the pollution and contamination of germs of various diseases.

b) **Controlled Use of Agricultural Chemicals:** The agricultural chemicals like pesticides, fertilizers and weedicides etc. should be used according to their need.

c) **Processing of Industrial Wastes:** It is important that every industry must have a decomposition plant for the decomposition of their wastes.

Land Pollution (Solid Wastes):

Definition: "All those solid materials which are useless and produced by human or animal activities are included in solid wastes".

Decomposable Wastes: It includes the wastes like useless parts of fruits, vegetables and other plant residues etc. It also includes the wastes of animals. It is also called as garbage.

Non-Decomposable Wastes: These materials cannot be burnt or decomposed safely by simple decomposition methods. These are tyres, tins, car board, plastics and rags.

Solid Waste

Big Cities: Main source of solid wastes are the big cities.

Methods to Reduce Land Pollution:

a) Polythene bags should be banned.

b) If not banned polythene bags should be properly disposed off.

c) The waste materials should be collected from all parts of cities and disposed off somewhere else.

d) Solid wastes of decomposing type should be converted into valuable fertilizer and used in the production of house plantation.

e) Plastic and glass materials should be recycled to produce the useful materials again.

7. What are the sources and harmful effects of different air pollutants?

Ans: There are many sources and harmful effects of air pollutants. Some of them are given for each type of pollutant.

Carbon dioxide:

Sources: Its sources include exhaust of industries, vehicles, respiration process being carried in all the living things and fermentation process.

Harmful Effects:

a) Breathing problems

b) Global warming.

Carbon mono-oxide:

Sources: Its sources are incomplete combustion of any type of fuel, cigarette smoke, exhausts from vehicles and industries.

Harmful Effects:

a) It causes headache, damages our nervous system.

b) This gas is so much toxic that even a mild concentration in air may cause death.

Sulphur dioxide:

Sources: Electric power stations, some insecticides containing sulphur in them, industries and vehicle exhausts.

Harmful Effects:

a) Irritation in eyes and nose.

b) Difficulties in breathing.

c) The most important problem is the occurrence of acid rains.

d) Problems of diseases like bronchitis, lung cancer etc.

Nitrogen oxides:

Sources: Exhaust of factories, mills and vehicles and burning of coal and oils having contamination of nitrogen.

Harmful Effects:

a) These oxides also contribute to acid rains by making nitric acid.

b) Health hazards like cough, headache etc.

c) Green house effect.

d) Many diseases like those of lungs.

Lead compounds:

Sources: Main source is the vehicles exhaust.

Harmful Effects:

a) These compounds are extremely dangerous to plants so cause deforestation.

b) Lead poisoning, sleepiness and damage to brain may also occur.

Chlorofluoro Carbons:

Sources: Their sources include refrigerators, air conditioners, aerial sprays of chemicals containing these elements.

Harmful Effects:

- They cause thinning of ozone layer.
- They are the causes of green house effect.

Ozone:

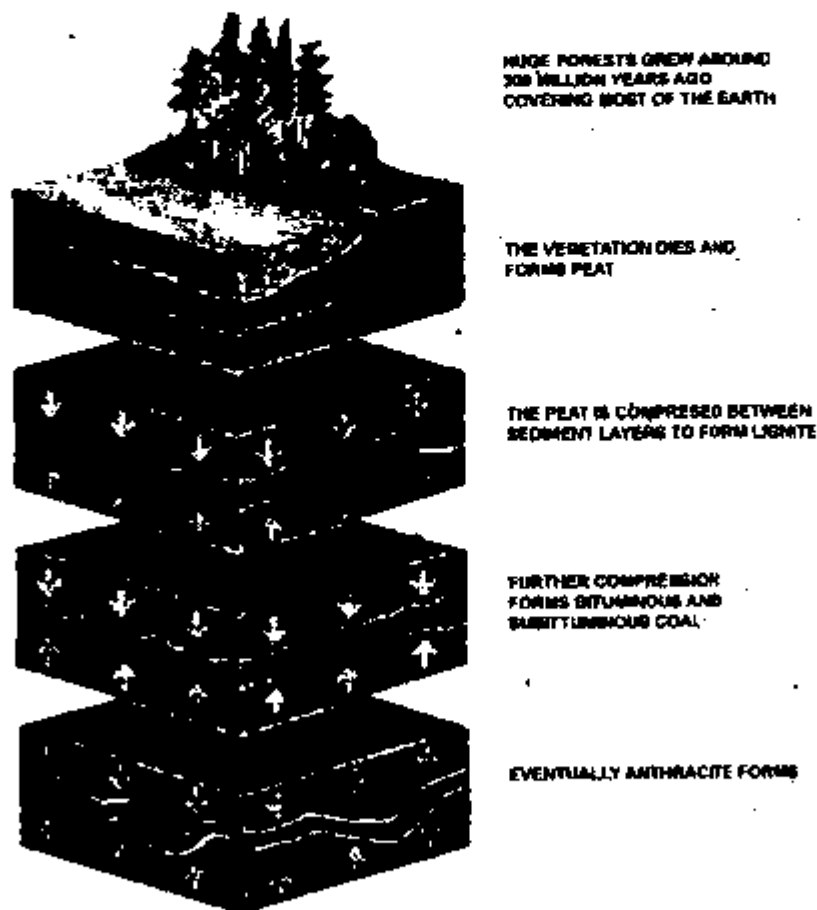
Sources: Its source is the exhaust of vehicles.

Harmful Effects:

- It causes respiratory diseases.
- It is dangerous to plants so causes deforestation.

8. What is coal? What are its types?

Ans:

Coal:

Formation of different forms of Coal

"Coal is black solid or semi-solid material found beneath the earth's surface as a mineral".

Process of Coal Formation:

Coal is produced under the natural conditions forming various intermediate stages. It should be noted that all of these intermediate stages are still present as mineral resources of coal.

a) **Formation of Peat:** In the old ages when oxygen envelope was not there around earth, there was very fast growth of trees. When these plants/trees died, their dead bodies were buried into the soil. By the process of application of huge pressure and temperature these were converted into peat. Peat is a soft and brownish form of coal.

b) **Formation of Lignite:** It is a soft form of coal. It is bad quality coal and used in the formation of firebricks. It is formed from peat by the application of high pressure and heat.

c) **Formation of Bituminous Coal:** Due to further application of pressure and heat lignite is converted into this form. Its colour is brownish black and it is more hard form of coal. It is used in power generation and formation of coke.

d) **Formation of Anthracite:** It is formed from bituminous form by the same procedure of pressure and heat application. It is high quality coal which is black in colour and hard in texture. It contains highest percentage of carbon element. Its efficiency in burning is very good and it is used for domestic heating.

9. Write a note on petroleum and natural gas.

Ans: Petroleum and natural gas are usually held together. Petroleum is present as liquid while natural gas is held over this liquid.

Petroleum:

Features:

a) It is a liquid form of hydrocarbons in which some solid or gaseous hydrocarbons are dissolved.

b) It is brownish or greenish black in colour.

c) **Formation**: The formation of petroleum began in very old times, millions of years ago. The dead animals and plants sank deep into the bottom of sea where they were buried under mud, sediments and sand. Due to the years of application of high temperature, pressure and microbial activities, they were converted into petroleum and accumulated beneath some impermeable layer of rock. This is the crude form of petroleum which is not used directly.

d) **Fractional Distillation:** It is a method of purification which is used in the refining of petroleum. In this case the crude oil is subjected to a very high temperature of about 400° C using electric furnace and converted into vapours. Now different fractions from the vapours are separated.

Fractions of Petroleum:

a) **Refinery Gases:** It is the only gaseous fraction of petroleum which is used in the domestic and industrial energy production.
b) **Petrol:** It is also called as Gasoline. It is used as a fuel for light engine vehicles like cars, motorcycles, small agricultural instruments like sprays etc.
c) **Kerosene Oil:** It is used for domestic energy production. It is also burnt in the engines of aircrafts and heavy-duty vehicles.
d) **Waxes:** It is used for candle making and lubricant in industry.
e) **Residues**: Their main use is the carpeting of roads.

Natural Gas:

Features:

a) It is chemically a mixture of gaseous hydrocarbons.
b) Most important gas among all is methane which is more than 80%. Other gases are ethane, propane and butane.
c) It also contains some toxic compounds of sulphur and nitrogen.

d) Before the ultimate consumption of gas all the toxic materials are removed.
e) It is mostly found over petroleum and coal reservoirs.
f) Natural gas can also be found as a separate entity.
g) Its advantages over other fuels include cheapness, cleanliness, smokeless-ness and handy-ness.
h) It is used to obtain energy and some chemical substances.
i) In case of energy it is used both at domestic and industrial levels.
j) It is used to run thermal power plants.
k) It is also used in the manufacturing of fertilizers.

10. Write a detailed note on the natural and mineral resources of Pakistan.

Ans:

Minerals:

"The elements or compounds naturally found beneath the earth's surface, soil or rocks are called minerals".

These substances are extracted from their original place and used in the welfare of man. In Pakistan more than 370 minerals have been discovered. Some of these are silver, gold, chromite, gypsum etc. Some of these are discussed as follows.

Coal:

a) There are about 500 million tones of coal deposits.

b) Coal found in Pakistan is of bad quality. Its moisture percentage is high while carbon percentage is very low.

c) It is mostly used in brick kilns.

d) It is also used for the production of electricity in thermal power stations.

e) Deposits of coal are found in Sharg, Khost, Harran, Bolan, Mulch, Degar, and Sour in Baluchistan. In Punjab they are present at Kalabagh, Makrawal, Calache, Warcha and Dandot.

Petroleum:

a) Instead of large deposits of petroleum we are not still self-sufficient in this facility.

b) Our local deposits fulfill only 30% of our domestic needs.

c) Its deposits are present at Khorr, Dholion, ChakNarrang, Tut, KotSarang, Meyal, Dhormond, Dhudak, BalKasar, Joyanir, Adhl and Karsal.

d) Oil refinery called Attock Oil Refinery is present in Rawalpindi.

e) Khaskhaeli, Badin, Tandoadam and Tandoalam are the areas in Sindh where its deposits are found.

f) In Karachi two refinery units are working.

g) There many foreign companies which are in search of oil reservoirs in Pakistan. These are working in coordination with oil and gas development organization of Pakistan.

Natural Gas:

a) The main source of energy in Pakistan is natural gas.

b) Natural gas fulfills about 35% of our energy requirements.

c) Largest deposit of natural gas is found at Sui in Baluchistan.

d) Natural gas deposits in Pakistan are present at Mial, Pirkoh, Uch, Sari, ChakSarang, Dhudak, Dholion, Khairpur and KandKot.

Chromite:

a) It is an ore which is present in the form of brown or black coloured material.

b) Largest deposits of this mineral are present in Pakistan.

c) In Pakistan the deposits are present at Muslim Gagh, Chagha, Kharan, Pashin, Khanazai, Waziristan, Malakand.

d) It is used for the formation of steel.

e) Chromium metal is extracted from this ore.

f) It's properties are white and shining luster, resistance to rusting and corrosion.

g) Protective layer for doorknobs, car parts and many items of iron are made.

h) Alums of chromium are used in photography, paints and tanneries.

i) Nichrome alloy is also made from it.

Gypsum:

a) It is a shining white, soft and yellowish mineral.

b) In Pakistan it is found in Chakwal, Sanghar, Dadu, Dhundot, Mianwali, Dera GhaziKhan, Quetta, Sibbi, Kohat and Daudkhel.

c) It is used for the formation of glass, cement and plaster of Paris.

d) It is applied for the removal of salinity in saline and water logged areas.

Gem Stone:

a) It is composed of aluminium, silicon and beryllium.

b) It is famous for its shine and beauty.

c) It is resistive to wear and tear.

d) It has the property of reflection of light giving it shine.

e) It is used in jewellery after polishing and cutting.

f) It is found in Swat, Hunza valleys, Chitral and Kaghan.

Mica:

a) It is a group of minerals like compounds of aluminium,

potassium and silicon.

b) It is found in Hazara, Swat, Chitral.

c) It is non-conductor of electricity.

d) It can split into thin layers.

e) It is used as an insulator in electronic and electric devices like transistors, fans, irons, heaters, and dynamos.

Iron:

a) It is a mineral of blackish colour.

b) This is the mineral on which the development of the country depends.

c) Largest deposits of iron are present at Kala Bagh.

d) It is also found at Chitral, Khuzdar,Muslim Garh, Nakhuandi.

e) 16% of the needs of country are fulfilled by its domestic resources.

f) There is a steel mill at Karachi in Pakistan where iron is used as a raw material.

g) It is used to make different alloys.

h) Steel is prepared from this mineral.

Salt:

a) At Khewra largest deposits of salt are present. It is considered to be the biggest salt deposit of the world.

b) In Pakistan it is also found at Warcha, Kalabagh and Bhadar Khel.

c) It is used in the commercial preparation of caustic soda, washing soda and backing soda.

d) Its most common use is as the table salt.

Copper:

a) In Pakistan it is found at Sandak and Chaghi in

Baluchistan in large quantities.

b) Very precious metals like gold, silver and molybdenum are present in its ore.

c) It is a very good conductor of heat and electricity.

d) It is used in communication and electronic devices.

e) It is used for the manufacture of electricity cables.

11. What are non-renewable and renewable resources? How they conserved in Pakistan.

Ans:

Conservation:

"It refers to the efficient use of natural resources according to their requirement so that there should be least wastage".

There different methods of conservation. Some of them are discussed below:

Conservation of Non-renewable resources:

Definition: "Those resources which cannot be replaced in nature are called non-renewable resources."

These include the natural deposits in the form of minerals like coal, petroleum, metals, gas etc. These can be conserved as:

a) **Efficient and Careful Use:** Keeping in view the fact that these resources cannot be recovered after their use, we should use these resources according to our need. Methods should be discovered so that there should be maximum out put with minimum of inputs used. These include the careful use of coal, gas, petroleum etc.

b) **Least Wastage:** There should be least wastage of natural resources.

c) **Construction of Building:** There should be proper ventilation, layout, material, used in construction etc. This is so that least energy is consumed in living.

d) **Use of Renewable Resources:** The sources other than oil, gas should be used for the achievement of

energy. These include solar energy, hyderal energy and nuclear energy.

e) **Use of Modern Techniques:** There some techniques like cracking and reforming by which the petroleum resources of the world have been doubled.

f) **Use in the Constructive Purpose:** These natural resources should be used only in the constructive purposes.

Conservation of Renewable Resources:

Definition: "These are those resources which can be replaced in nature after their use".

These include crops, water, wind, sunlight, many minerals and productivity of soil.

So they should be conserved in the following ways:

a) **Efficient and Careful Use:** It is of vital importance that the renewable resources should be used efficiently for maximum production. This is because energy is required for the management of these resources so if there is more production it will consume least energy.

b) **Recycling:** There are some resources like iron metal that can be reused in the production of commodities. So such resources should be collected from the places where they are thrown and used in the production units again.

c) **Management of Resources:** It is important that these resources should be managed in such a way that there should be least consumption of energy.

d) **Application of Artificial Materials:** There are many artificial materials that can be used as an alternative to the natural resources. For example different house holds like chair, table, dinner sets, baskets and also other things like casings of different devices can be made with plastic instead of iron.

12. What is the importance of agriculture in Pakistan? Discuss the production trends of different crops.

Ans:

Agriculture:

Definition: "It is a science, art and industry of managing living natural resources like animals and plants for providing better and more food to man".

Importance:

a) Pakistan is an agricultural country and most of our industries also depend on agriculture.

b) Share of agriculture in our GDP (Gross Domestic Production) is 25 %.

c) About two third part of Pakistani population is directly or indirectly engaged in agricultural activities by profession.

d) 47 % of our labour is employed in this sector.

e) 60% of our total exports are based on agriculture like leather, fish, rice, cotton etc.

Production Trends in Crops:

A lot of research has been carried out in improving the production of agricultural crops. There are different methods to bring improvement in this sector like management of water and soil resources, good cultural practices, cultivation of better and productive varieties.

Example: The production of old varieties of wheat used in Pakistan was not more than four quintals. A new variety called Maxi Pak has now enhanced this production upto thirty quintals. Production trends in different agricultural crops are:

Kharif Crops:

Definition: "These are the crops of summer season which are sown in April-June and harvested in October-December".

Examples: rice, sugar cane, cotton, jowar, bajra, and maize.

Rice:

a) Rice is an important crop of Pakistan, which is cultivated for domestic use and export.

b) It is estimated that one-third of its production is exported in the foreign counties.

c) This crop occupies 10% of total cropped area of Pakistan.

d) Basmati rice of Gujranwala is famous all over the world due to its taste, aroma and flavour.

e) Water requirements of this crop are very high.

f) Its seeds are first allowed to grow in small area and nursery is prepared. When these nursery plants attain a height of one foot, they are transplanted into the field which is flooded with water.

g) Water is kept in the field for the whole crop period. Only a few days before harvesting water is removed.

h) Basmati rice is the best variety of rice in quality.

Cotton:

Cotton Crops

a) It is a non-food crop.

b) It is called "Silver of Pakistan".

c) It is used as a raw material in the textile industry.

d) Many insect pests and diseases attack it.

e) It is very sensitive to weather conditions.

f) Research institute situated in Multan is doing research on different aspects of cotton production improvement. For example they have evolved high yield and fine and long fibre varieties of cotton.

g) It is grown in Southern Punjab and Sindh due to favourable environmental conditions.

Sugar cane:

a) This crop is used in the production of sugar.

b) In recent years we have become self-sufficient in sugar due its bumper production.

c) 5% of our total cropped area is covered by this crop.

d) It is mostly grown in Punjab, Sindh, Mardan, Dera Ismail Khan and some other areas of N.W.F.P.

Rabi Crops:

Definition: "These are the crops of winter season which are grown in October-December and harvested in April-May".

Examples: wheat, chickpeas, tobacco, barely and mustard etc.

Wheat:

Wheat Crops

a) Wheat is the single largest wheat crop of Pakistan.

b) It is the staple food of Pakistan.

c) Annual production of Pakistan is about 20 thousand million tons which is very less from many wheat growing countries of world.

d) It is grown mainly in Interior and Southern Punjab and upper parts of Sindh.

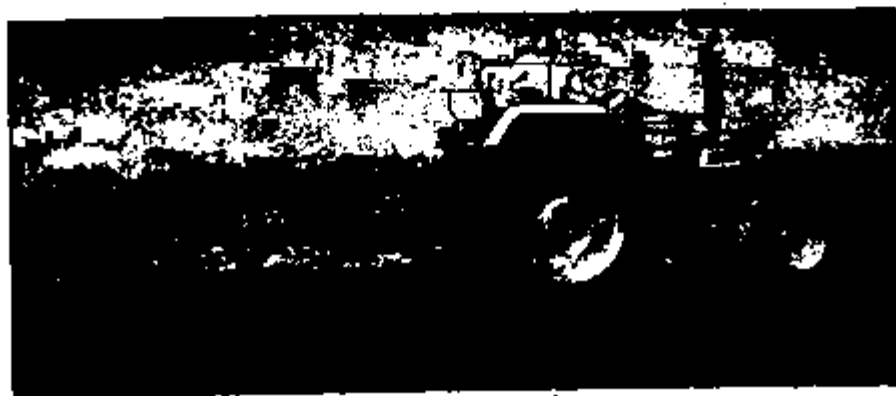
Fruits:

Mango Oranges Raspberry Apples Almonds

a) Pakistan is famous all over the world in fruit production. Our fruits are of best quality, shape, texture, size, taste and smell.
b) Main fresh fruits are apples, mangoes, bananas, guava, dates, lemons, melons and oranges.
c) Main dry fruits are coconut, almonds, walnut, pine and peanuts.

13. Define mechanization. What are its different methods?

Ans:

Mechanization:

A Tractor with Implements

Definition: "It refers to the modern techniques used in crop production like use of certified seeds, fertilizers, plant protection technology and use of modern machines like combine harvesters, efficient irrigation methods etc.".

Importance: The mechanization is important because it saves time, labour and capital of farmer thus increasing his production.

Steps Taken for Mechanization:

Use of Modern Machinery:

a) Use of modern implements in agriculture improves crop production due the more efficiency involved.

b) Our farmers are now adopting tractors, harvesters in agriculture.

c) ADBP is now giving loans to farmers to help them in purchasing the agricultural implements.

Tube Wells:

a) If in case of shortage of irrigation water from canals or if there are drought conditions then alternative source of water are tube wells.

b) Pakistan has lacs of tube wells both at public and private sector. This water is not only used in agriculture but also used for the industrial and domestic use.

Plant Protection:

a) One of the very effective methods of improvement in crop production is the control of diseases and pests of crops.

b) Government is providing facilities like pest scouting, aerial sprays and advisory services to the farmers in order to control the pests and diseases of crops.

Agricultural Credit:

a) It refers to the help of the farmers through financial assistance to purchase inputs like seeds, fertilizers, pesticides, machinery etc.

b) It is much helpful in improving the crop production and bringing prosperity in agriculture sector.

14. What is dairy farming? Discuss its importance and different products.

Ans:

Dairy Farming:

"It is a sub-sector of livestock and includes the caring and keeping of milk animals like buffalos, cows, sheep and goat".

Purpose and Importance:

a) It is associated to the production of very important food of man i.e. milk and its products like cream, butter, yogurt, butter oil, ice cream and cheese.

b) Most important areas where dairy farms are present are Islamabad, Lahore, Faisalabad, Karachi, Sheikhupura, Sargodha, Okara and Sahiwal.

c) Majority of rural population is involved in the dairy raising. The rural people fulfill their milk needs from domestic animals.

d) Every family keeps 2-3 cattle or buffalo and 5-6 sheep or goat at rural level.

e) Rural people earn 30-40 % of their income from dairy farming.

f) Many dairy farms are mostly present near big cities because these cities provide a big market for the sale of the milk and its products.

g) Central and Southern Punjab and lower Sindh are more important in dairy farming.

Milk Production and Its Products:

a) Milk and its products constitute very essential part of human diet.

b) The production of milk is every day increasing.

c) In Pakistan milk is being produced through dairy forms on commercial level.

d) There was a need to improve the milk production in the early nineteenth century because the demand of milk was more than its production.

e) A project funded by Asian Development Bank has been launched through out the country to improve the production of milk. Its objectives are to provide technical assistance to the farmers and to train them about modern techniques being practiced in dairy farming.

f) Many organizations have been established that collect milk from villages and refrigerate it in order to inhibit the growth of microbes that caused fermentation, and souring of milk.

g) Milk products include cream, butter, ghee, yogurt, cheese, ice cream etc.

15. Write a note on fisheries and wildlife.

Ans:

Fisheries:

It is a very important aspect of agriculture and play's an important role in the GDP of Pakistan. In the central belt of Sindh and Baluchistan it is the main economic activity.

Importance of Fish Farming:

a) Fish farming is the caring and rearing of fish in artificial ponds.

b) In rivers, lacks, ponds and dams inland fishery is also practiced instead of marine fisheries.

c) Fish farming is very popular activities in the rural areas.

d) Fish provides quality white meat.

e) Fish is exported to foreign countries to earn foreign exchange. Pakistan exports fishery products to USA, UK, Japan, Middle East countries and Germany.

Improvement in Fisheries:

Many steps have been taken to improve this activity in

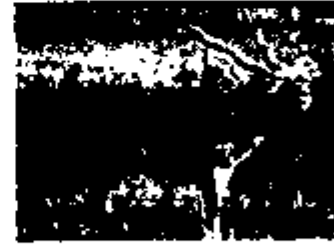
Pakistan. Some of these are:

a) Establishment of fisheries.
b) Provision of training to local fish farmers and interested people.
c) Fisheries harbour has been established at Karachi and Peshawar.
d) Establishment of hatchery complex for the production of seeds of fish and shrimp.

Wild Life:

Definition: "The word wild life refers to all the non-domesticated animals and wild (uncultivated) plants of a particular area".

Lion | Tiger | Asiatic cheetah

Indian One-horned Rhinoceros | Swamp deer | Blackbuck

Diversity in Wild Life of Pakistan:

Climatic conditions of one area of Pakistan are very much different from other areas thus resulting in a variety of habitats. Due the presence of various habitats wild life in Pakistan is very diversified. Wild animals, birds and plants of different parts of the country are different.

Wild Birds and Animals:

Fauna of different areas of Pakistan is different.

Peacock

Pelican

Ibises

Northern Mountains: Long spiral horned white markhors, white gorial and urials are present in these areas. In the upper regions where snow falls, leopard, tigers etc. are found.

Hilly Plains: A wide variety of cats, rats, rabbits, reptiles, hyena, foxes, sparrows, crows and snakes are found.

Southern Areas: These areas contain gazelle, peacocks and hug deer etc.

16. What do you mean by endangered species? How they are conserved?

Ans:

Endangered Species:

Definition: "The endangered species are those species which are in a danger to be distinct due to unavailability of their natural habitat and food because of human activities".

Explanation: Man has destroyed the nature due his development and progress. He has finished the feeding, breeding and shelter providing places for animals and plants. This has caused many fauna species to be distinct.

Distinct Species: These are the species, which are no more existing on earth.

Examples: Hog deer, Musk deer, Snow Leopard, Koel or black bird are now distinct. Water fowl, whales other sea fauna is also reducing.

Conservation: Government has taken many steps for the conservation of wild life.

a) Wild life departments have been established through the country.

b) Shooting, hunting, trapping and killing of animals have been banned.

c) National parks have been established in different parts of country. These parks not only provide recreation to people but also provide security and breeding places to a wide variety of endangered species.

Wild Life Parks of Pakistan:

Keerther National Park: It is extended over an area of 3000 square miles. It provides shelter to Sindhi goats black birds.

Khunjrab National Park: It covered Khurjrab, Gojarab and Shamshal valley. It provides shelter to marcopolo sheep, blue sheep, snow leopards, libices.

Lal Suharara Park: It is present in Bahawalpur. It takes care of blue cows, black deer and musk deer. Aquatic land and plant environment is also provided to animals in this park.

National Hazara Gangi Park: It is present in Baluchistan. In this park almost natural environment is provided to the wild life.

17. Write a note on the marine resources of Pakistan.

Ans:

Marine Resources:

Definition: "Marine resources refer to all the living or dead useful materials that we get from sea".

Tuna **Sardine** **Shrimp** **Salmon**

Marine Resources of Pakistan:

Coastal area of Pakistan is spread over an area of 700 km

lengthwise. This area also contains international marine trade seaports from where the materials are supplied to the whole country. Different useful materials are obtained from sea like food, minerals, medicinal plants, ornamental plants etc.

Sources of Food:

a) Sea is a good source of food for the people of those areas that live in the coastal areas.

b) In Pakistan about 400 varieties of edible fish are present.

c) Main varieties of fish are Huron, tuna, sardine, shrimp and salmon.

d) Fish is also used to make products like cod-liver oil of fish.

e) Fish and fish products are good sources of foreign exchange.

f) Many sea plants and algae are obtained from sea and used for medicinal or ornamental purposes.

g) Government of Pakistan, has taken many steps to improve fisheries like providing financial support to farmers, establishment of training centres, fisheries in different parts of country and provision of technical facilities to farmers. These activities have improved the socio-economic condition of the people associated to fisheries.

Sea Minerals:

Multi Colour Corals

a) Seawater contains different dissolved and suspended salts and compounds, which can be obtained by very

simple methods.

b) Evaporation of seawater provides table salt.

c) Other salts like magnesium sulphate, potassium sulphate, sodium sulphate etc. can also be extracted from water by simple physical methods.

d) Elements like Bromine, Iodine and Magnesium are also obtained from seawater.

e) According to an estimate one cubic km of seawater contains twelve tons of salt mixtures.

Ornamental Plants and Animals:

a) There are different types of plants, animals and corals, which are used for ornamental purposes.

b) Corals are used for their multi-coloration.

c) Many plants are used for interior decoration.

d) Skin of several animals is used for making purses, shawls, garments, gloves and coats.

Medical Products:

a) Marine plants and animals are being used for medicine purposes since ancient times of human's history.

b) Marine flora and fauna is being used to derive medicine for some of the very dangerous diseases of this age like cancer and AIDS.

18. What is the growth rate of population of Pakistan? What are its effects on the ecosystem of an area?

Ans:

Growth Rate of Pakistan:

The growth rate of population in Pakistan is very high. According to the annual growth rate i.e. three percent, it has been estimated that total population of our country will be doubled in the next twenty-five years.

Total Population of Pakistan:

According to the last consensus total population of Pakistan is

more then 140 million. The increase in population with such rate leads to many problems. It disturbs the ecosystem adversely.

Philosophy of Ecosystem and Effects of Population:

Definition: "Ecosystem is a biological complex in which different biotic and abiotic factors interact with each other".

Explanation:

a) Plants depend on animals for carbon dioxide excreted by them during respiration. Animals also provide manure, minerals and nutrients through their feaces and dead bodies to plants.

b) Plants are necessary for the survival of animals on earth. They provide oxygen which basic need for respiration. Animals get food, medicine and shelter against harsh weather and enemies. Plants are also the sources of fossil fuel.

c) The increased population disturbs the ecosystem because the ecosystem will not be able to provide sufficient food to such a huge population.

19. What are the effects of deforestation and urbanization?

Ans:

Deforestation in Pakistan:

This problem in Pakistan has become severe. Our forest area now has been reduced to 5%. According to international standards at least 15% forest area in a country is necessary for the proper functioning of all the ecosystems. So we do not even carry half of it.

Why Deforestation:

People cut the trees, plants and shrubs for their residence, cultivation of crops and rearing of livestock. There is no proper planning for the re-plantation of cut trees.

Effects of Deforestation:

a) Due to deforestation all the ecological cycles are disturbed. Supply of oxygen is reduced and percentage of carbon dioxide is increased that leads to abrupt changes in climate.

b) Due to increase in carbon dioxide percentage our earth is warming which is further linked to many problems.

c) As more and more area is being used for extensive agriculture, so land fertility has been decreased. This is because crop plants deplete the soil nutrients but there is no source for the reclamation.

d) Plants decrease the intensity of wind and water in case of storms and floods. In case of reduction in the wind speed, losses are reduced while in case of reduction of water speed during floods, more water infiltrate in soil conserving soil and water.

e) Forests control soil erosion by interrupting in the physical eroding factors.

f) Forests are very important sources of income of a country.

g) Forests are of soul importance in aesthetic point of view.

Urbanization in Pakistan:

In Pakistan people are migrating form villages to the big cities in search of better facilities. Percentage of urban population was less than 10% during the first quarter of 1900s, which has now become more than 30%.

Reasons of Migration of People to Cities:

a) Unavailability of livelihood in villages.

b) Health activities are not efficient and adequate in villages.

c) The agricultural area has been decreased and converted to small patches due to division and re-division from generation to generation.

d) The fertility of land has been decreased.

e) The farmer does not get his proper economic return of his produce.

f) The lands are not so much productive due many natural and cultural problems.

g) Search of good life standards.

h) The rural people are fascinated with the glamour of city life.

i) The young people of villages who get education from cities do not wish to return to the village life and settle permanently in the cities.

j) Vocational and educational facilities are not proper in villages.

k) The feudal system of lords is one of the main factors of people's migration to cities.

Effects:

a) There is sudden increase in the population of cities and it has increased from 9.8% to 31.5% during pervious century.

b) The quality of life has been adversely affected. People have to eat low quality food, live in congested houses and lack natural environment.

c) Some people are deprived of basic needs of food, clothing and housing.

d) Pakistan's per capita income is very low.

e) People with more children have to support big family.

f) The living environment is not hygienic and lead to many diseases.

g) **Effects of Over-population on Poverty:**

h) The income of people has been decreased due to increase in population.

i) The income of people is not sufficient for fulfilling their basic needs.

j) People are bound to work day and night for their survival.

k) Demand of doubt is increasing day by day.

l) The increase in population has resulted in the increase in the prices of the commodities due to more demand and less supply.

m) Most of the youth is un-employed even after getting high qualification.

n) As the jobs are less so people try to get the services from their employs on the least payment. This has made the life of poor more and more difficult.

Solved Exercises of Text Book

1. Complete the following statements:

vi. Nitrogen and oxygen form _________ of the volume of air near earth.

vii. Troposphere extends from surface of earth upto _________ km.

viii. Ozone is _________ for us.

ix. About 15th of the energy is _________ by the atmosphere.

x. Lignite contains _________.

Answers:

i)	ii)	iii)	iv)	v)
99.9%	12	umbrella	absorbed	less carbon

2. Tick (✓)the following statements either True or False:

i)	Carbon monoxide is produced due to complete combustion of fuel.	False
ii)	Fertilizer cause water pollution by releasing phosphorous and nitrates.	False

iii)	Deforestation and rising population are becoming a cause of global warming.	True
iv)	Kharif crops are sown during April-June ands harvested during October-December.	True

3. Encircle one choice a, b, c or d in each case:

1. Which sphere or layer consists of 80 % of the mass of sphere?

a) Troposphere b) Stratosphere
c) Mesosphere d) Thermosphere

Ans: Troposphere

2. Ozone layer exists above the earth about:

a) 25km b) 30km
c) 35km d) 40km

Ans: 30km

3. Coal that contains the highest percentage of carbon is:

a) Lignite b) Bituminous
c) Sub bituminous d) Anthracite

Ans: Anthracite

4. Which friction or product of petroleum is used in cars as fuel?

a) Petrol b) Kerosene oil
c) Diesel oil d) Lubricating oil

Ans: Petrol

5. Land covered with forest in Pakistan is only.

a) 3% b) 5%
c) 7% d) 9%

Ans: 5%

4. Define atmosphere. Describe the composition of air and explain different layers of atmosphere.

Ans: See Q. No. 1 for answer.

5. Define green house effect and explain how it maintains the temperature of earth and warm it.

Ans: See Q. No. 3 for answer.

6. Explain why thicker clouds have very dark bases?

Ans: As the clouds have the ability to reflect the solar radiations back to the space. Thicker are the clouds more will be the reflection and vice versa. So if the clouds are thicker they will reflect more solar light to back to the space and their base will become dark.

7. Explain why there is global warming?

Ans: Main green house gas is carbon dioxide, which is being produced by humans, animals, vehicles, industries etc. at faster rate. The rate of their production is faster than the production of oxygen excreted during photosynthesis. This is increasing the percentage carbon dioxide in the atmosphere resulting in the increase of average temperature. It is called as global warming.

8. What is air pollution? Mention the importance of air pollution.

Ans:

Air Pollution:

Our air has been polluted due to the combustion of fossil fuels in automobiles, machines, factories and mills thus adding waste gases in the atmosphere. Important pollutants of air are:

a) **Smoke:** It includes the smoke and soot produced by the burning of fuel.

b) **Hazardous Gases:** These gases include carbon dioxide, nitrogen oxides, carbon mono-oxide, lead particles and sulphur dioxide.

Methods of Reduction in Air Pollution:

These methods include:

a) The fuels should be purified of all the impurities before their use.

b) Combustion of the fuels should be complete so that no soot or carbon mono-oxide is produced.

c) Checking the increase in the automobiles on road and increasing the plants through efficient plantation programmes can reduce carbon dioxide concentration.

Importance of Air Pollution:

Problems Associated to Air Pollution:

Air pollution causes headache, irritation of eyes, tension, anxiety and also damages lungs and nervous system.

Carbon dioxide:

Sources: Its sources include exhaust of industries, vehicles, respiration process being carried in all the living things and fermentation process.

Harmful Effects:

a) Breathing problems

b) Global warming.

Carbon mono-oxide:

Sources: Its sources are incomplete combustion of any type of fuel, cigarette smoke, exhausts from vehicles and industries.

Harmful Effects:

a) It causes headache, damages our nervous system.

b) This gas is so much toxic that even a mild concentration in air may cause death.

Sulphur dioxide:

Sources: Electric power stations, some insecticides containing sulphur in them, industries and vehicle exhausts.

Harmful Effects:

a) Irritation in eyes and nose.

b) Difficulties in breathing.

c) The most important problem is the occurrence of acid rains.

d) Problems of diseases like bronchitis, lung cancer etc.

Nitrogen oxides:

Sources: Exhaust of factories, mills and vehicles and burning of coal and oils having contamination of nitrogen.

Harmful Effects:

a) These oxides also contribute to acid rains by making nitric acid.

b) Health hazards like cough, headache etc.

c) Green house effect.

d) Many diseases like those of lungs.

Lead compounds:

Sources: Main source is the vehicles exhaust.

Harmful Effects:

a) These compounds are extremely dangerous to plants so cause deforestation.

b) Lead poisoning, sleepiness and damage to brain may also occur.

Chlorofluoro Carbons:

Sources: Their sources include refrigerators, air conditioners, aerial sprays of chemicals containing these elements.

Harmful Effects:

- They cause thinning of ozone layer.
- They are the causes of green house effect.

Ozone:

Sources: Its source is the exhaust of vehicles.

Harmful Effects:

a) It causes respiratory diseases.

b) It is dangerous to plants so causes deforestation.

9. Describe different types of water pollution. How it can be controlled?

Ans: See Q. No. 6 for answer.

10. Describe how coal is formed explain its different types.

Ans: See Q. No. 8 for answer.

11. Describe how the natural and mineral resources in Pakistan can be conserved?

Ans: See Q. No. 11 for answer.

12. Explain the production trends of the principle crops of Pakistan.

Ans: See Q. No. 12 for answer.

13. Explain the mechanization in agriculture sector of Pakistan.

Ans: See Q. No. 13 for answer.

14. What is ecosystem?

Ans: See Q. No. 18 for answer.

15. Explain the effects of deforestation on environment.

Ans: **Effects of Deforestation:**

a) Due to deforestation all the ecological cycles are disturbed. Supply of oxygen is reduced and percentage of carbon dioxide is increased that leads to abrupt changes in climate.

b) Due to increase in carbon dioxide percentage our earth is warming which is further linked to many problems.

c) As more and more area is being used for extensive agriculture, so land fertility has been decreased. This is because crop plants deplete the soil nutrients but there

is no source for the reclamation.

d) Plants decrease the intensity of wind and water in case of storms and floods. In case of reduction in the wind speed, losses are reduced while in case of reduction of water speed during floods, more water infiltrate in soil conserving soil and water.

e) Forests control soil erosion by interrupting the physical eroding factors. So land erosion is being increased.

16. Explain the effects of urbanization.

Ans: See Q. No. 19 for answer.

1. Define atmosphere.

Ans: The envelope of different gases surrounding the earth is called atmosphere. These gases include nitrogen, oxygen, carbon dioxide, water vapours and some trace gases.

2. How ozone layer is being depleted?

Ans: There are some compounds like those of chlorine, fluorine and carbon called CFCs that are depleting the layer of ozone. The ozone damaging compounds are used in spray cans, refrigerators, and air conditioners. These gases are released into the atmosphere and damage to the ozone layer.

3. What are the dangers associated to the depletion of ozone layer?

Ans: In case of ozone depletion the ultra violet rays will come on the earth causing many problems like skin cancer in humans and animals, making soil uncultivable by the

destruction of soil microorganisms and effecting the ecosystems.

4. What is the function of ozone layer?

Ans: There are rays of many wavelengths and energy which are coming from sun to earth. Among these ultra violet rays are dangerous for life on earth so the ozone layer prevents these rays to come on earth by absorbing and reflecting back to space.

5. What is troposphere?

Ans: Its height is 12 km from earth's surface. It carries 80% of total mass of atmosphere. Clouds and water vapours are present in this layer. All the weather phenomena are carried out in this region.

6. Give some features of thermosphere.

Ans: It is extended up to 500 km from earth's surface. The temperature of this region is very high. It is observed that the temperature in this area exceeds to 1000° C.

7. How ozone can be protected from depletion?

Ans: To protect the ozone layer it is important to decrease the production of carbon dioxide and other wastes from vehicles, factories, mills and domestic fuel consumption.

8. Define green house effect.

Ans: The phenomena in which the atmospheric gases like carbon dioxide, ozone and water vapours act like the glass or plastic of green house in the maintaining of temperature is called green house effect.

9. What are the problems associated with the global warming?

Ans: This phenomenon is causing many problems like increase in the sea level, unusual changes in temperature, untimely rainfall and snowfall etc.

10. What is the fate of solar radiations reaching earth?

Ans: Less than one half of the radiations reach the surface of earth. Most of these radiations are absorbed at the surface and only a small portion is reflected again to the space. Out of these radiations some part is used up by plants for the production of food in the process of photosynthesis.

11. What do you mean by the climate of an area?

Ans: There are different weather factors like temperature, humidity, rain fall etc. When all of these factors are recorded for as many as thirty years, the average value is called climate of that particular area. The climate of an area might be cold, dry or warm.

12. What are the problems associated to air pollution?

Ans: Air pollution causes headache, irritation of eyes, tension, anxiety and also damages lungs and nervous system.

13. What are non-decomposed wastes?

Ans: These materials can not burnt or decomposed by simple decomposition methods. These are tyres, tins, car board, plastics and rags.

14. What are the sources of carbon dioxide?

Ans: Its sources include exhaust of industries, vehicles, respiration process being carried in all the living things and fermentation process.

15. Define agriculture.

Ans: It is a science, art and industry of managing living natural resources like animals and plants for providing better and more food to man.

16. What are the minerals?

Ans: The elements or compounds naturally found beneath the earth's surface, soil or rocks are called minerals. These substances are extracted from their original place and used in the welfare of man. Some of these are silver, gold, chromite, gypsum etc.

17. How peat was formed in the old ages?

Ans: In the old ages when oxygen envelope was not there around earth, there was very fast growth of trees. When these plants/trees died, their dead bodies were buried into the soil. By the process of application of huge pressure and temperature these were converted into peat.

18. What is fractional distillation of petroleum?

Ans: It is a method of purification, which is used in the refining of petroleum. In this case the crude oil is subjected to a very high temperature of about 400° C using electric furnace and converted into vapours. Now different fractions from the vapours are separated.

19. How petroleum is formed in the soil?

Ans: The dead animals and plants sank deep into the bottom of sea where they were buried under mud, sediments and sand. Due to the years of application of high temperature, pressure and microbial activities, they were converted into petroleum.

20. Give some harmful effects of carbon mono-oxide.

Ans: It causes headache, damages our nervous system. This gas is so much toxic that even a mild concentration in air may cause death.

21. Where gypsum is found in Pakistan?

Ans: It is found in Chakwal, Sanghar, Dadu, Dhundot, Mianwali, Dera GhaziKhan, Quetta, Sibbi, Kohat and Daudkhel.

22. What do you mean by non-renewable resources?

Ans: These are those resources which cannot be replaced in nature. These include the natural deposits in the form of minerals like coal, petroleum, metals, gas etc.

23. What are Kharif crops?

Ans: These are the crops of summer season which are sown in April-June and harvested in October-December.

These are rice, sugar cane, cotton, jowar, bajra, and maize.

24. Define conservation.

Ans: It refers to the efficient use of natural resources according to their requirement so that there should be least wastage.

25. How efficient use of non-renewable natural resources helps in conservation?

Ans: Keeping in view the fact that these resources cannot be recovered after their use, we should use these resources according to our need. Methods should be discovered so that there should be maximum out put with minimum of inputs used. These include the careful use of coal, gas, petroleum etc.

26. Why the people do deforestation?

Ans: People cut the trees, plants and shrubs for their residence, cultivation of crops and rearing of livestock. There is no proper planning for the re-plantation of cut trees.

27. What are the crop production trends in Pakistan?

Ans: A lot of research has been carried out in improving the production of agricultural crops. There are different methods to bring improvement in this sector like management of water and soil resources, good cultural practices, cultivation of better and productive varieties. All of these activities are being done for the improvement in yield per acre.

28. What is meant by endangered species?

Ans: The endangered species are those species which are in a danger to be distinct due to unavailability of their natural habitat and food because of human activities.

29. What is the use of aquatic life in medical?

Ans: Marine flora and fauna is being used to derive medicine for some of the very dangerous diseases of this age like cancer and AIDS.

30. What is mechanization in agriculture?

Ans: It refers to the modern techniques used in crop production like sue certified seeds, fertilizers, plant protection technology and use of modern machines like combines harvesters, efficient irrigation methods etc.

31. What is dairy farming?

Ans: It is a sub-sector of livestock and it includes the caring and keeping of milk animals like buffalos, cows, sheep and goat. It is associated to the production very important food of man like milk and its products like cream, butter, yogurt, butter oil, ice cream and cheese.

32. What is meant by Rabi crops?

Ans: These are the crops of winter season which are grown in October-December and harvested in April-May. These include wheat, chickpeas, tobacco, barely and mustard etc.

33. To what extend the urbanization has increased in Pakistan in the last century?

Ans: In Pakistan people are migrating form villages to the big cities in search of better facilities. Percentage of urban population was less than 10% during the first quarter of 1900s, which has now become more than 30%.

34. What are the causes of deforestation?

Ans: People cut the trees, plants and shrubs for their residence, cultivation of crops and rearing of livestock. There is no proper planning for the re-plantation of cut trees.

35. What is the growth rate of population in Pakistan?

Ans: The growth rate of population in Pakistan is very high and it has been estimated that total population of our country will be doubled in the next twenty-five years.

36. Name some minerals obtained from sea.

Ans: Evaporation of seawater provides table salt. Other minerals like magnesium sulphate, potassium sulphate, sodium sulphate, Bromine, Iodine and Magnesium are also obtained from seawater.

37. What is an ecosystem?

Ans: Ecosystem is a biological complex in which different biotic and abiotic factors interact with each other. These ecosystems can as small as a drop of water as large as that of a lack.

38. What steps government has taken to improve fish industry in Pakistan?

Ans: Government of Pakistan has taken many steps to improve fisheries like providing financial support to farmers, establishment of training centres, fisheries in different parts of country and provision of technical facilities to farmers.

39. What is the use of sea life in ornamental purposes?

Ans: Many sea plants are used for interior decoration while skin of several sea animals is used for making purses, shawls, garments, gloves and coats.

40. What are distinct species?

Ans: These are the species, which are no more existing on earth like Hog deer, Musk deer, Snow Leopard, Koel or black bird are now distinct and have vanished from the earth.

a) Chose the most appropriate choice:

1. **In our country about ____% of total export earnings come from agriculture based commodities.**
   a) 40 b) 80
   c) 20 d) 60

2. **The annual production of wheat is more than ____ million tons in our country.**
   a) 18 b) 16
   c) 20 d) 14

3. **Rice occupies ____ % total cropped area.**
   a) 10 b) 14
   c) 12 d) 8

4. **The best variety of rice is _____ variety.**
   a) Chakwal 97 b) Bastati
   c) Dasi Pak d) Maxi Pak

5. **Cotton is called _____ of Pakistan.**
   a) Shine b) silver fiber
   c) diamond d) Gold

6. **Pakistan has a vast coastal area about _____ km in length.**
   a) 770 b) 800
   c) 700 d)707

7. **The population of country is about ____million.**
   a) 140 b) 104
   c) 144 d) 410

8. **Annual rate of population increase is ____%.**
   a) 3 b) 4
   c) 2 d) 5

9. In ____-system plants, animals and human beings exist together.

a) socio b) economic
c) eco d) neo

10. Pakistan has only ____% land covered.

a) 15 b) 10
c) 16 d) 20

11. The migration of rural people to cities is called_____.

a) socialization b) urbanization
c) canonization d) citizenship

12. The rate of urbanization has increased from 9.8% to _____ % in country.

a) 31.5 b) 5.31
c) 13.5 d) 51.3

13. Our earth is surrounded by an envelope of gases called _____.

a) stratosphere b) atmosphere
c) hydrosphere d) troposphere

14. Air consists of _____% of nitrogen and 21 % of oxygen.

a) 76 b) 87
c) 72 d) 78

15. The warming effect of atmospheric gases is called ____ effect.

a) ozone b) green house
c) CFC house d) white house

16. It is due to green house effect that average temperature of earth is _____C°.

a) 12 b) 20
c) 21 d) 15

17. ______ means reduction in the forest areas.

a) deforestation b) plant removal
c) deplantation d) deforestization

18. Southern _____ has suitable area for cotton growth in Pakistan.

a) Punjab b) Baluchistan
c) Sindh d) NWFP

19. We are self sufficient in:

a) cooking oil b) petrol
c) vegetable oil d) sugar

20. Rabi crops are grown in:

a) December b) April
c) July d) March

21. Cotton research institute is situated in:

a) Multan b) Bahawalnagar
c) Chakwal d) Sahiwal

22. Kharif crops are grown in:

a) December b) April
c) October d) May

23. Maxi Pak is a variety of:

a) rice b) cotton
c) sugarcane d) wheat

24. 47% of labour is employed in:

a) marketing b) industry
c) exports d) agriculture

25. Pakistan has ____ million tons of coal deposits.

a) 500 b) 150
c) 5000 d) 510

26. More than _____ minerals have been discovered from Pakistan.

a) 730 b) 703
c) 370 d) 307

27. ____ gas saves life from radiations of sun on earth.

a) carbon dioxide b) oxygen
c) sulphur dioxide d) ozone

28. During 1995 population in cities was____%:

a) 13.5 b) 15.3
c) 31.5 d 51.3

Answers:

1. d	8. a	15. b	22. c
2. a	9. c	16. d	23. d
3. a	10. a	17. a	24. d
4. b	11. b	18. a	25. a
5. b	12. a	19. d	26. c
6. c	13. b	20. b	27. d
7. a	14. d	21. a	28. c

Fill in the blanks and True or False questions are not included in the examination paper. However the same are being given for Memory Test of students.

a. *Fill in the blanks:*

1. Our earth is surrounded by an envelope of gases called_____.
2. Human lives at _____ atmospheric sea of gases.
3. Air consists of _____% nitrogen.
4. Air consists of _____% oxygen.
5. _____% of carbon dioxide is present in air.
6. Troposphere extends from surface of earth upto around_____ kilometres.
7. Troposphere consists of about _____% of mass of atmosphere.
8. _____ consists all clouds and water vapours.
9. Stratosphere lies above _____ and extends upto 50 kilometres.
10. _____% of mass of atmosphere exists in troposphere and stratosphere.

11. Mesosphere extends upto ____km.
12. Thermosphere is a region that extends upto ____km.
13. Rise in temperature of thermosphere depends upon ____ activity.
14. Temperature of thermosphere rises upto _____° C.
15. Ozone layer exists about ____km above the earth surface.
16. Ozone has ______ smell.
17. Ozone shields and protects life on earth against ______.
18. _____ compounds were considered responsible for the depletion of ozone.
19. Depletion of ozone will cause increase in skin ______cases.
20. The warming effect of atmospheric gases is called _____.
21. It is due to green house effect that average temperature of earth is _____°C.
22. About _____ of energy is absorbed by atmosphere.
23. About ____ of sunlight is reflected by clouds.
24. Less then ______of sun's energy coming to earth actually reaches the surface.
25. Climate is the ____weather conditions of a region over a longer period of time.
26. The concentration of ______ in the atmosphere is increasing day by day.
27. It is expected that carbon dioxide level will rise to ____from its present level in coming years.
28. Smoke and soot is produced fro burning of ____.
29. The two major sources of domestic water pollution are ____ and ____.
30. The disposal of solid wastes is a serious problem in ____ cities.

31. Air pollution is main sources of ______.
32. The process of formation of fossil fuels is much slower than the rate of ____.
33. Refinery gases are used for ____ and ____ purposes.
34. Natural gas is mixture of _____ carbons.
35. Nearly _____ percent needs of energy are met by natural gas.
36. ____ means using only according to requirement as efficiently as possible.
37. Resources that can not be replaced in nature are called ______ resources.
38. Pakistan is an ______ country.
39. ______ is called silver fibre of Pakistan.
40. ____ is industrial crop of Pakistan.
41. It is estimated that known oil reserves could be ____% depleted by the year 2020.
42. Crude oil is heated upto about _____°C.

Answers:

1.	earth atmosphere	22.	one fifth
2.	bottom	23.	one fourth
3.	78	24.	half
4.	21	25.	average
5.	0.03	26.	carbon dioxide
6.	12	27.	double
7.	80	28.	fossil fuel
8.	troposphere	29.	detergents
9.	troposphere	30.	big
10.	99.9	31.	disease
11.	80	32.	consumption
12.	500	33.	domestic, industrial
13.	solar	34.	gaseous
14.	1000	35.	35
15.	30	36.	conservation

16.	pungent	37.	non renewable
17.	harmful	38.	agricultural
18.	ultraviolet	39.	cotton
19.	cancer	40.	sugar cane
20.	green house effect	41.	90
21.	15	42.	400

b) Indicate the True/ False Statements:

1. Ozone is pollutant gas.
2. Oxygen is expired by the plants.
3. Burning of oil produces large amounts of oxygen gas.
4. Industries and vehicles are contributing a large to reduce the pollution.
5. Air can also serve as a disease germs carrier.
6. Ozone is harmful and causes some diseases in animals.
7. The fossil fuels are the renewable sources of energy.
8. Refinery gas is used for domestic use.
9. Waxes are used for the surfacing of roads.
10. Light duty vehicles use diesel oil as fuel.
11. First finest liquid friction of petroleum is petrol.
12. The purest form of coal is lignite.
13. Sui is situated in Sindh.
14. Sulphur dioxide also produces as by product from the power plants.
15. Cotton is called silver fibre of Pakistan.
16. Sugar is derived from sugar beat.
17. Maxi Pak variety enhanced the yield upto 50 quintiles.
18. Rabi crops are sown in April.
19. Rice is grown on the 30% of the total area of the total area of Pakistan.
20. Pakistan is popular in mango production and its export.
21. Pakistan agriculture is highly mechanized.
22. Contribution of agriculture is 25% in Pakistan.

Answers:

1. False	9. False	17. False
2. True	10. False	18. True
3. False	11. True	19. False
4. False	12. False	20. True
5. True	13. False	21. False
6. True	14. True	22. True
7. False	15. True	
8. True	16. True	

c. Identify and label the following figures:

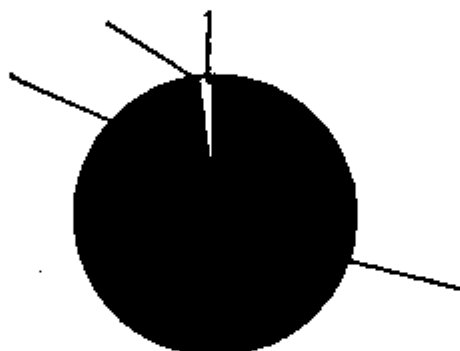
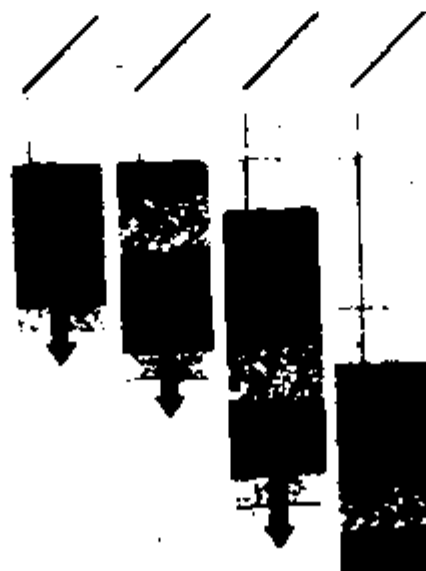



Figure 1

Figure 2

8 Current Electricity

Section-I

Introduction to Chapter

Contents: This chapter deals with the following topics.

- Concepts Relating to Current.
- Voltage.
- Resistance and Its Importance.
- Ohm's Law.
- Electric Circuits.
- Capacitors.
- Types of Capacitors.
- Transformers.
- DC and AC.
- Dangers of Electricity.
- Measures of Safety from Electricity.
- Measuring Devices Used In Electronics.
- Conversion of Galvanometer into Voltmeter and Ammeter.

Section-II

Comprehensive Questions with Answers

1. What is electric current? How it is measured?

Ans:

Electric Current:

Definition: "The amount of charge flowing per second through a conductor is called electric current".

Explanation: There are two types of charges i.e. positive and negative charges. When one or both types of these charges flow it causes the production of an electric current.

Measurement of Electric Current:
Electric current is expressed in the unit Ampere and is measured using a device called ammeter.

Ampere:

Definition: "The current produced is one ampere when a charge of one coulomb is flowing in one second".

Smaller Units: If the current is weaker then it is measured in smaller units like milli-ampere, microampere i.e.

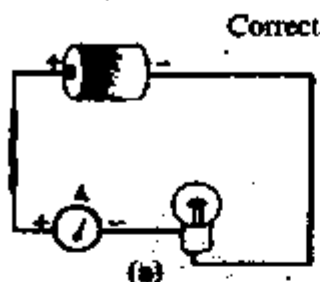
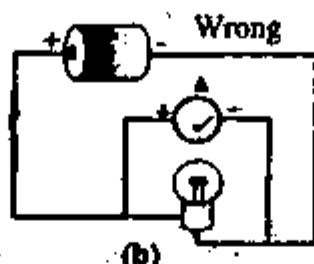
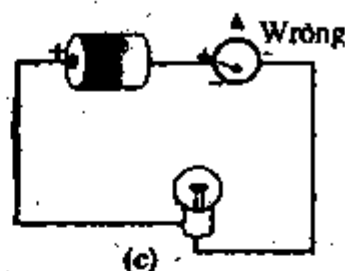
$1A = 1000\ mA$
$1A = 10^6\ \mu A$
or $1mA = 1000\ \mu A$

Ammeter:

Definition: "The device used to measure the electric current is called ammeter".

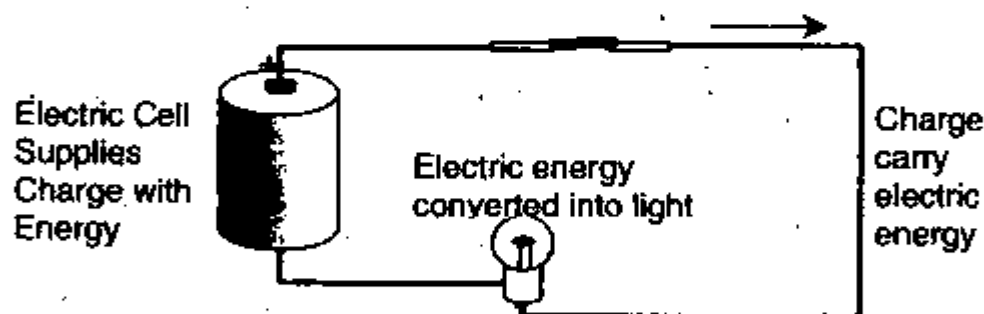
According to the amount of current to be measured, different types of ammeters are available in the market.

Connecting Ammeter to the Battery: The ammeter should be connected to the battery in such a way that its positive end

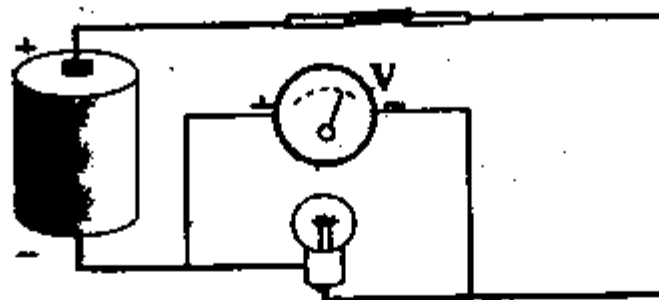
connects to the positive end of the battery and negative end connects to the negative end of the battery.

Correct connection of Ammeter | Wrong connection of Ammeter | Wrong connection of Ammeter

2. **What is voltage? Explain.**

Ans:

Voltage:

Definition: "The quantity of energy supplied by the source to each unit of electric charge causing it to flow is called voltage".

Explanation: Voltage is also called as "potential difference". It is basically the deriving force that causes the charges to flow between two points. This force is provided through some electric energy source like electric cells or batteries.

Importance: When the electric charges are allowed to flow through circuit they loose some energy in the way and convert a part of it into some other forms like light or heat energy. We require these forms of energy in our daily life activities.

Measurement: Voltage is measured using a device called voltmeter. If a voltage is to be measured between two points in circuit the two ends of voltmeter are connected to those two points. It gives the voltage between those two points.

Voltmeter across the bulb

3. **What is resistance? What is the effect on resultant resistance when different resistors are connected in series or parallel combination?**

Ans:

Resistance:

Definition: "The opposition offered by a conductor towards current in a circuit is call resistance of that conductor".

Explanation: When the charged particles move through a conductor there are collisions of the charged particles with the atoms or molecules of that conductor. This causes to oppose the movement of those charged particles.

Uses of Resistance:

a) The collision of charged particles causes the production of heat and light energy. Therefore the filaments of electric bulbs are made using very highly resistive wires.

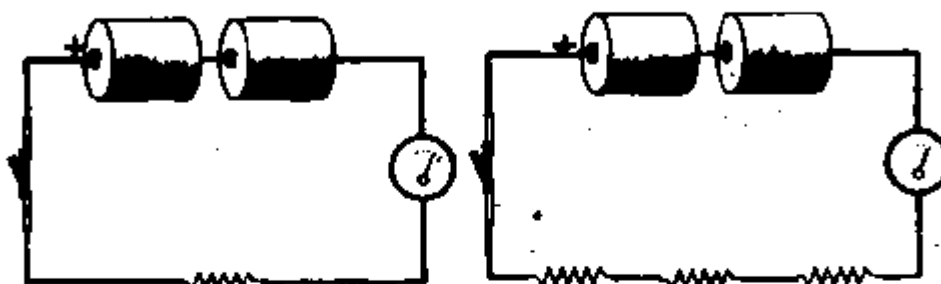
b) The resistance is also used to control the electric current in a circuit.

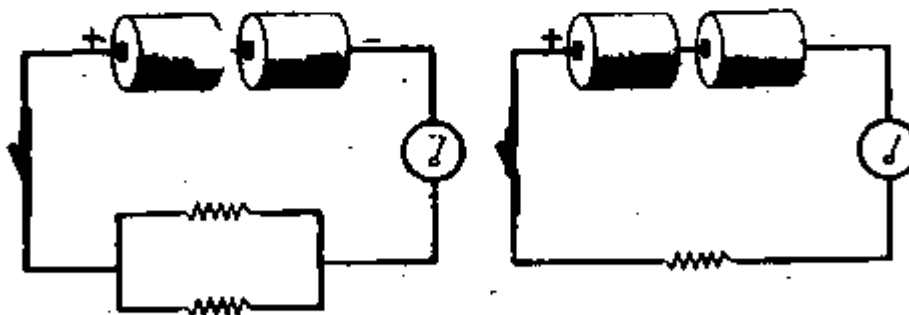
Types of Resistors/Conductors: There are two types of resistors according the resistance offered by them. Firstly there are some good conductors like aluminium, copper and silver. They offer very small amount of resistance. Secondly there are some poor conductors like iron that offer more resistance towards flow of current.

Measurement of Resistance: The measuring units of resistance are ohm (Ω), kilo ohm (kΩ) or mega ohm (MΩ).

Combination of Resistors:

Resistors can be connected in two combinations i.e.

a) **In Series Combination:** When different resistors are connected in a series the total or resultant resistance is equal to the sum of all the resistances connected in the circuit. So by connecting resistors in series the total resistance increases.

Series combination

b) **In Parallel Combination:** When different resistors are connected in a parallel combination, many passages are available to the current to flow so the current flowing through a particular resistor decrease causing total resistance to decrease. Therefore connecting different resistors in a parallel combination can reduce total resistance.

Parallel combination

4. Define and explain Ohm's Law.

Ans:

Ohm's Law:

Definition: "It states that the current in a conductor is directly proportional to the voltage applied across its ends".

Mathematically:

$$I \propto V$$

$$\boxed{V = IR}$$

Where R is a proportionality constant indicating resistance of the conductor. Its unit is Ohm.

Ohm:

"If a voltage of one volt is applied across a conductor and a current of one ampere flows through it the resistance offered by it is one ohm".

As $V = IR$
Or $R = V/I$
So 1 Ohm = 1volt/ 1 ampere

5. What is meant by electric circuits, switches and resistors? Give different types of resistors.

Ans:

Electric Circuits:

Definition: "The path along which charged particles move is called an electric circuit".

Components: There are many components of circuit including voltage supply like battery or electric cell, switches, electric bulbs, resistors or measuring devices etc.

Switches: These are the components of a circuit, which are used to make or break the circuit. There are many types of switches depending upon the types of circuit and the amount of current flowing through it. They might have two or more terminals.

Laboratory Switches: The laboratory switches are simple having a gap between them. When circuit is to be made, a key is inserted into the gap.

Resistors: The components that provide resistance to the flow of current are called resistors. These might be the appliances or specially made equipment for providing a measured amount of resistance. Different resistors may have

many values of resistance varying from fractions of ohms to Mega ohms.

Types of Resistors: There are two types of resistors.

a) **Fixed Resistors:** These are the resistors whose resistance remains constant. There are many types of these resistors like carbon resistors, metal oxide resistors, wire wound resistors etc.

b) **Variable Resistors:** These are the resistors whose resistance is not constant.

6. What are capacitors? Give their different types.

Ans:

Capacitors:

Definition: "The device used to store the electric charges is called a capacitor".

Structure: A capacitor consists of two metal plates, which are held together in parallel position. An insulating material is present between the two plates. The amount of charge stored on the capacitor depends upon the voltage applied across its ends, the nature of insulating material and geometry of the two metal plates.

Capacitance:

Definition: "The capacitance of a capacitor can be defined as the capability of that capacitor of storing electric charge".

Measuring Units: The capacitance is expressed in terms of Farad indicated by F. A Farad. It is a big unit so it has its sub-units like micro farad (10^{-6} F), nano farad (10^{-9} F) and pico farad (10^{-12} F).

Types of Capacitors: Capacitors can be classified into different groups according to many criteria like:

a) Fixed or variable capacitors.

b) Classification according to insulating materials: These may be air capacitors, electrolytic capacitors, mica capacitors, paper capacitors, ceramic capacitors , polythene capacitors etc.

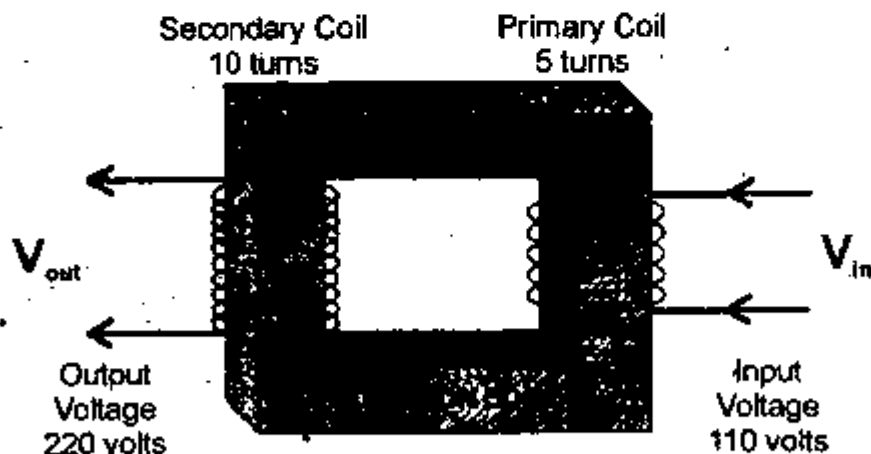
Uses of Capacitors:

- Capacitors are often used for the smoothness of D.C. current supply which contain some A.C. component. This is because they have the ability to block D.C. while allowing A.C. to flow.
- Electronic capacitors of large capacitance are used to filter out A.C. component present in D.C of rectified A.C. in power supplies.
- If a capacitor is used in a circuit it becomes frequency dependent and only allow to pass certain frequencies.
- Capacitors are used in almost all the electronic devices like amplifiers, televisions, radios, computers, digital watches etc.

7. What are transformers? Give their structure and use.

Ans:

Transformers:

Definition: "The devices used to step up (increase) or step down (decrease) voltage are called transformers".

A Transformer

Structure: In a simple transformer a primary and a secondary coil are present. These two coils are wound one over the other or kept very close to each other. There is a frame of mostly iron on which the two coils are wound. The primary coil is connected to the A.C supply. As the variation in the primary

voltage occurs it induces a voltage in the secondary coil.

Limitation: There is a limitation in the transformers that they can be used only in case of A.C current. An alternating voltage V_{in} is supplied to primary coil that induces an alternating voltage V_{out} in the secondary coil.

Use of Iron Core: In most of our transformers core is made up of iron, on which the two coils are wound. It has been estimated that the use of iron core increases efficiency of transformers more than hundred times.

Uses of Transformers:

a) Transformers having iron core are used in power transformers ranging from milliwatts to megawatts.
b) The transformers seen on poles in our streets convert very high voltage of 11000 volts into 220 volts on which all of our home and office appliances work.

Types of Transformers:

There are two types of transformers i.e.

Step Up Transformers: These transformers convert low voltage into high voltage.

Step Down Transformers: These are the transformers that convert high voltage into low voltage.

8. What is the difference between D.C and A.C? Explain.

Ans:

D.C or Direct Current:

Definition: "In this case current flows only in one direction from positive to negative terminal of D.C source".

Explanation: There many types of D.C sources including cells, batteries and dynamo etc. They have two terminals which are marked as positive (red coloured) and negative (black coloured). These sources provide a current whose flow is only from positive to negative.

A.C or Alternating Current:

Definition: "In this case the current changes its direction continuously".

Explanation: This type of current is produced by generators. The electricity supplied by WAPDA is in this form. We use electricity at homes of 50 hertz whereas an electric current of the frequency of 60 hertz is also used in some countries.

9. How electric power is conducted from its source to the area of consumption?

Ans: **Conduction of Electric Power:** The current produced at one place is transported to other place with the help on wires of some conductor material. There are some requirements for such transport. These are:

Thickness of Conducting Wires: The power units produced at power station are high so thick wires are needed for carrying such large currents.

Examples: If there is 60 watt bulb that operates at 6 volts will require a current of 10 ampere. For the carrying of these 10 amperes of current thick wire of copper is needed because the common wires used for conduction of electricity are thinner and become hot when large currents are passed through them. But the use of such heavy wires is also a problem in congested area. So it is preferable for us to use a source of 100 volts instead of 6 volts. This will reduce the current requirement up to 0.6 amperes instead of 10 amperes.

High Voltage In Transport: As the electric power is the product of voltage and electric current so by increasing one figure other figure can be reduced by keeping same value of electric power. Thus for the transmission purposes a very high voltage is maintained. This reduces the amount of current in the wire causing less charges to be transported avoiding hotness and therefore loss of energy in the transmission wire.

Benefit of Using A.C Source: The A.C current provides a chance to use transformers for the increase or decrease in the voltage. The gird stations distribute an electricity of 11,000 volts through long distances. When this electricity reaches the streets of cities, the transformers installed there convert this

voltage into 220 volts for domestic utilization.

10. What types of dangers are associated to the electricity?

Ans: In modern age most of our gadgets run on electricity. Along with so much diverse use of electricity it is also associated to some dangers. These dangers include electric shocks, short circuit and electrocutions etc.

Accidents of Electricity:

Following accidents may occur with electricity.

a) **Electric Shock:** In an electric shock the current start flowing through our body. This happens when we touch some bear wire. This may cause some unconsciousness or a hard shock.

b) **Short Circuit:** In case of short circuit the two negative and positive wires touch each other causing a very high amount of electricity to pass through the wire due low resistance. This causes the wire to heat up that may lead to fire.

c) **Electrocution:** It is a sever form of an electric shock in which a person touching a naked wire may die.

Conditions for Electric shock: An electric shock may occur if a current of more than 1 mA flows through our body or an electric voltage of more than 50 V is applied across our body.

Dangerous Situations Associated to Electricity:

Damaged Insulation: In case of a damaged insulation two types of problems may occur i.e.

Damage Insulation

Short Circuit: The two wires may get a touch to each other leading to a fire.

Electric Shock: When some person get a touch to the damage insulation wire he might get a hard or mild shock.

Overloading: In this case too many appliances may be attached to a single supply wire. This causes a high amount of current to pass through the wire making it hot.

Overloaded Outlet

Associated Danger: This may lead to fire.

Damp Condition:

Pure water is not a conductor of electricity but when some salts, acid or ions are mixed with it, it may behave as a conductor. So person with wet body or clothes may get a stronger electric shock or even electrocution as compared to a person with dry body if he touches a wire with 220 V of voltage.

11. What type of safety measures can be taken when dealing with electricity?

Ans: Many safety measures can be taken in order to avoid accidents. Some of these are:

a) The damaged wires, plugs and sockets should be replaced regularly.
b) The earth wired appliances should be used.
c) All plugs, switches and fuses should be attached to wire properly.
d) In case of any kind of repair the main supply should be turned off.

e) In case of bear hands any electricity component like switches, fuses, appliances, sockets should not be touched.

f) The electric appliances should be avoided to be used at the wet places like pathrooms.

g) The power sockets should not be overloaded.

h) Damaged electric components should not be used.

i) Faulty electronic appliances should first be corrected then used.

j) Nothing should be inserted into the electric plugs.

k) The electric plugs should be fitted at higher position in order to avoid from children.

l) Any electric component should not be touched in case of bear feet.

12. How electricity is distributed from the main wire to our entire home? What type of safety devices can be used to control the electric accidents?

Ans: **Electricity Reaching Our Home:** The electricity reaching our homes is consisting of two type of wires i.e. one is called live wire and the other is called neutral wire.

Consumers Unit: The wires reaching our home first enter into this box from where electricity is supplied to the whole our home appliances.

Safety Devices: Many safety devices like switches, fuses, circuit breakers and earth leakage circuit breaker are used as safety devices.

Main Switch:

This switch is of great importance because it is attached to the live wire entering the home. The electricity supplied to all the home appliances can be turned off by switching it off. In case of any accident in the home the main switch should first be turned off quickly.

Fuses:

Fuse is actually a thin piece of wire which is attached at any point in the circuit.

Fuses

Use of Fuses: These fuses can be used as a fire preventive measure due to electricity. The wire of fuse melts in case of high current flow thus saving the home from fire.

Types of Fuses: The fuses are rated according to the maximum current that would be allowed to pass through the circuit. In the market fuses of 1 A to 10 A are easily available. The rating of the fuse should be proper so the it neither should allow so much current to pass through it that it result in a fire nor melt at such a low current that an electric appliance should not work properly.

Circuit Breakers:

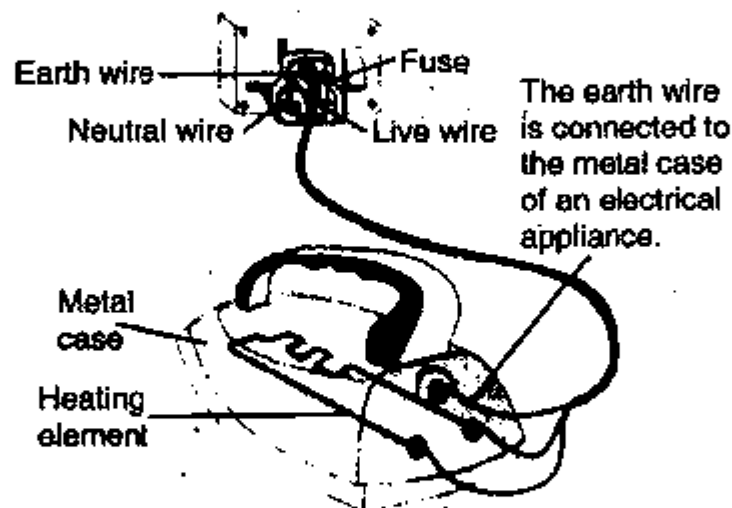
It is safer as compared to the fuse. This is because it does not need to change the wire.

Circuit Breaker

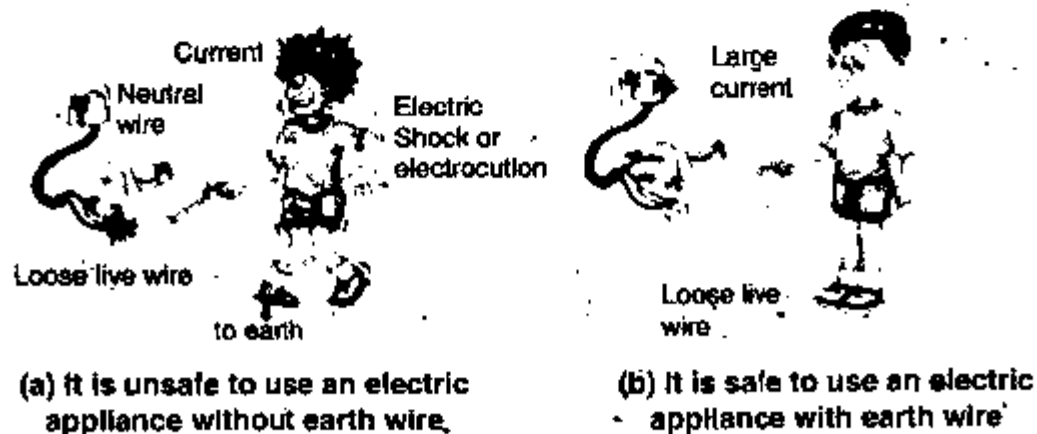
Uniqueness: The circuit breaker does not blow in case of high electric flow. It breaks the circuit by tripping or springing out its switch when the flowing current exceeds from the rating limit.

Restoration of Circuit Breaker: The circuit breaker can be restored simply by pressing its buttons up.

Earth Wire:

An earth wire is an additional wire to the normal live and neutral wires. Its one end touches to the casing of the electric appliance and the other end touches to the ground. This causes the current to flow into the ground if some loose wire touches the metal casing.

Earth wire connected to the metal case of electrical iron

(a) It is unsafe to use an electric appliance without earth wire.

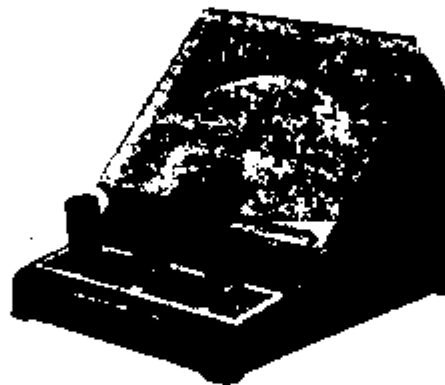
(b) It is safe to use an electric appliance with earth wire

Use of Earth Wire: Most of appliance casings are made up of some conducting metals. In case of touching of a loose or bear wire to the metal casing, it becomes live. If a person

touches this live he may get a hard shock or even electrocution. If the metal casing is attached to the earth wire a high amount of current flows into the ground in case of fault. This blows away the fuse of circuit due to high current flowing through it and the person touching to the casing is saved from electric shock.

13. What are the measuring instruments of electricity?

Ans: The devices used for the measuring of electricity are galvanometer, ammeter and voltmeter.

Galvanometer:

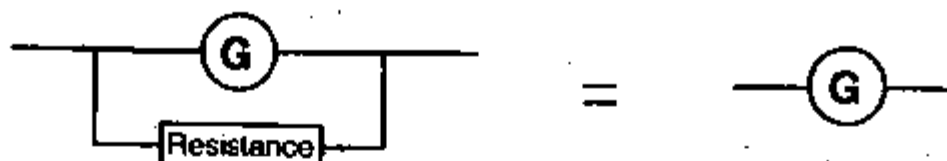
It is very sensitive and is the device that measures very small amount of current.

A Galvanometer

Structure: A moving coil type of galvanometer has a coil with a pointer pivoted between the poles of a U shaped magnet. It is provided with a scale on which the pointer moves.

Working: A small amount of current passing through the galvanometer causes a deflection of pointer on the scale. The deflection gives the value of current.

Ammeter:

It is used to measure the electric current. It is made by the modification of galvanometer.

Formation of Ammeter: When a low resistance wire is connected across a galvanometer it is converted into ammeter which can be used to measure high values of current.

Conversion of a galvanometer into an ammeter

Voltmeter:

This electric device is used to measure the voltage. It is also made up by the modification of galvanometer.

Formation of Voltmeter: When a high resistance is connected in series with the galvanometer it is converted to the voltmeter.

Conversion of a galvanometer into a voltmeter

Analogue and Digital Instruments: Galvanometer, ammeter and voltmeter are the analogue instruments of electric measurement which are not precise. Digital instruments which are more precise and give direct reading of electricity are now available in the market. The digit instruments are costly and not available at all the places.

Solved Exercises of Text Book

1. **Complete the following statements:**
   - i. Ammeter is used to measure ________.
   - ii. The unit of resistance is ________.
   - iii. Copper is a good ________ of electricity.
   - iv. A transformer work in ________.
   - v. The frequency of AC used in Pakistan is ________.
   - vi. A high resistance in series with a galvanometer converts it into ________.

Answers:

i)	ii)	iii)	iv)	v)	vi)
current	ohm	conductor	AC	50 Hz	voltmeter

2. Tick (✓) the following statements either True or False:

i)	One ampere is amount of current produced by a charge of one coulomb.	False
ii)	Every conductor has one resistance.	False
iii)	A capacitor is charge storing device.	True
iv)	A step up transformer has more turns in the primary than in the secondary.	False
v)	Ohm's law describes the relation between current in a conductor and voltage.	True

3. Encircle one choice a, b, c or d in each case:

i) The types of electric charges are:

a) one b) two
c) three d) four

Ans: two

ii) The unit of electric charge is:

a) ohm b) ampere
c) coulomb d) watt

Ans: coulomb

iii) Two cells of 2 volts are connected in parallel. The total voltage across them will be:

a) 4 volts b) 2 volts
c) 1 volt d) zero

Ans: 4 volts

iv) Which are of following is not true?

a) The unit of resistance is ohm
b) A resistance is a device used to store voltage
c) The current in an open circuit is zero
d) Electric current in a conductor decreases as the voltage across it increases.

Ans: A resistance is a device used to store voltage

v) A voltmeter is a galvanometer with:

a) high resistance parallel to it
b) high resistance in series with it

c) low resistance parallel to it
d) low resistance in series with it

Ans: high resistance in series with it

4. Define electric current and its units.

Ans:

Electric Current:

Definition: "The amount of charge flowing per second through a conductor is called electric current". Its unit is ampere

Ampere:

"The current produced is one ampere when a charge of one coulomb is flowing in one second".

5. What is an electric resistance?

Ans: The opposition offered by a conductor towards current in a circuit is call resistance of that conductor.

When the charged particles move through a conductor there are collisions of the charged particles with the atoms or molecules of that conductor. This causes to oppose the movement of those charged particles.

6. State ohm's law.

Ans: **Ohm's Law:** "It states that the current in a conductor is directly proportional to the voltage applied across its ends".

7. How will you define ohm?

Ans: When a current of one ampere is flowing through a conductor having one volt of voltage applied across its ends, the resistance offered by it is one ohm.

8. Explain what is a capacitor?

Ans: See Q. No. 6 for answer.

9. What is the behaviour of a capacitor in AC and DC circuits?

Ans: Capacitors are often used for the smoothness of D.C. current supply which contain some A.C. component. This is because they have the ability to block D.C. while allowing A.C. to flow.

Electronic capacitors of large capacitance are used to

filter out A.C. component present in D.C of rectified A.C. in power supplies.

10. What is a transformer? How it works?

Ans: **Definition:** "The devices used to step up (increase) or step down (decrease) voltage are called transformers".

Structure: In a simple transformer a primary and a secondary coil are present. These two coils are wound one over the other or kept very close to each other. There is a frame of mostly iron on which the two coils are wound. The primary coil is connected to the A.C supply. As the variation in the primary voltage occurs it induces a voltage in the secondary coil.

Working: The AC current is received in the primary coil. This current induces a magnetic flux that causes the production of an induced voltage in the secondary coil. The value of this induced voltage can be adjusted by the variation in the number of turns in the secondary and primary coils. So by doing this practice the voltage can either be reduced or increased.

11. What is the difference between step-up and step-down transformer?

Ans: The step-up transformer increases the voltage while step-down transformer decreases the voltage.

12. Describe some of the dangers common in using electricity.

Ans: See Q. No. 10 for answer.

13. What suggestions you will give for the safe use of electricity?

Ans: See Q. No. 11for answer.

14. Why fuses are used in electric circuits?

Ans: The fuses are used in the electric circuits in order to break the circuit in case of a high flow of electric charge.. This is because a sudden high flow in the wires may cause fire due to heating of wires.

15. Describe the working of galvanometer.

Ans: A small amount of current passing through the galvanometer causes a deflection of pointer on the scale. The deflection gives the value of current.

16. How a galvanometer is converted into an ammeter?

Ans: When a low resistance wire is connected across a galvanometer it is converted into ammeter which can be used to measure high values of current.

17. How a galvanometer converted into a voltmeter?

Ans: When a high resistance is connected in series with the galvanometer it is converted to the voltmeter.

1. What is electric current?

Ans: The amount of charge flowing per second through a conductor is called electric current. The charges are of two types i.e. positive and negative. The flow of both the charges is called electric current.

2. Define ampere.

Ans: The current produced is one ampere when a charge of one coulomb is flowing from a point in a conductor in one second.

3. How an ammeter is connected to the battery?

Ans: The ammeter should be connected to the battery in such a way that its positive end connects to the positive end of the battery and negative end connects to the negative end of the battery.

4. Define voltage.

Ans: The quantity of energy supplied by the source to each unit of electric charge causing it to flow is called voltage.

5. How voltage is measured?

Ans: Voltage is measured using a device called voltmeter. If a

voltage is to be measured between two points in circuit the two ends of voltmeter are connected to those two points. It gives the voltage between those two points.

6. What is resistance?

Ans: The opposition offered by a conductor towards current in a circuit is called resistance of that conductor. This opposition is due to the collisions of charges to the atoms of the conductor.

7. What are the types of resistors?

Ans: There are two types of resistors according the resistance offered by them. Firstly there are some good conductors like aluminium, copper and silver. They offer very small amount of resistance. Secondly there are some poor conductors like iron that offer more resistance towards flow of current.

8. What is Ohm? Give its definition.

Ans: It is the unit of resistance. If a voltage of one volt is applied across a conductor and a current of one ampere flows through it the resistance offered by it is one ohm.

9. Define capacitance.

Ans: The capacitance of a capacitor can be defined as the capability of that capacitor of storing electric charge.

10. How capacitance is measured in different units?

Ans: The capacitance is expressed in terms of Farad indicated by F. A Farad. It is a big unit so it has its sub-units like micro farad (10^{-6} F), nano farad (10^{-9} F) and pico farad (10^{-12} F).

11. What are the components of an electric circuit?

Ans: There are many components of circuit including voltage supply like battery or electric cell, switches, electric bulbs, resistors of measuring devices etc.

12. What is the limitation of transformers?

Ans: The limitation of the transformers is that they can be used only in case of A.C current. They cannot be used in case D.C.

13. How capacitors can be used for the smoothness of current?

Ans: Capacitors are often used for the smoothness of D.C. current supply, which contain some A.C. component. This is because they have the ability to block D.C. while allowing A.C. to flow.

14. Differentiate between direct and alternating current.

Ans: D.C. flows only in one direction from positive to negative terminal of D.C source while A.C changes its direction continuously.

15. What is the purpose of street transformers?

Ans: The transformers seen on poles in our streets convert very high voltage of 11000 volts into 220 volts on which all of our home and office appliances work.

16. What is the difference between electric shock and electrocution?

Ans: In an electric shock the current start flowing through our body. This happens when we touch some bear wire. This may cause some unconsciousness or a hard shock. While electrocution is its sever case that might lead to death.

17. Water is a non-conductor of electricity still can cause electric shock or electrocution. Why?

Ans: Only the pure water is a non-conductor of electricity. When only a small amount of salts, ions or acids are dissolved in it, it becomes a conductor of electricity and can cause an electric shock to a person with wet body or clothes.

18. Why core of transformers is made up of iron?

Ans: In most of our transformers core is made up of iron. It has been estimated that the use of iron core increases efficiency of transformers more than hundred times.

19. What do you mean by consumers unit?

Ans: The wires reaching our home first enter into a box from where electricity is supplied to the whole our home appliances. This box is called as consumers unit.

20. What is the use of earth wire?

Ans: An earth wire is an additional wire to the normal live and neutral wires. Its one end touches to the casing of the electric appliance and the other end touches to the ground. This causes the current to flow into the ground if some loose wire touches the metal casing.

a) Chose the most appropriate choice:

1. The electric current is the flow of______ charge.
- a) negative
- b) positive
- c) both
- d) both or single

2. The unit of current is:
- a) ampere
- b) farad
- c) ohm
- d) volt

3. Electric current has ______ relationship with voltage.
- a) no
- b) indirect
- c) direct
- d) none of these

4. The electric charges are caused by _____ to flow between two points.
- a) capacitance
- b) current
- c) resistance
- d) voltage

5. ______ is the equipment used to measure the electric current.
- a) ammeter
- b) rheostat
- c) voltmeter
- d) electric appliance

6. When two electric batteries are connected in a single circuit they connect from_____ ends.
- a) similar
- b) opposite
- c) both
- d) none of these

7. **Poor conductors have _____ resistance.**
   a) moderate b) less
   c) no d) more

8. **Mega ohm is a ______ unit of resistance than ohm.**
   a) larger b) similar
   c) smaller d) none of these

9. **Which one is not a type of a capacitor.**
   a) mica capacitor b) polythene capacitor
   c) paper capacitor d) coil capacitor

10. **Capacitors make ______ current smooth.**
    a) DC b) both
    c) AC d) none of these

11. **The main power lines used for the transmission of electricity contain _____ volts.**
    a) 10100 b) 1100
    c) 1000 d) 11000

12. **A minimum _____ volts of voltage is required for an electric shock.**
    a) 40 b) 60
    c) 55 d) 50

13. **If a more than _____mA of current flows through the body, it leads to electric shock.**
    a) 1.5 b) 0.1
    c) 1 d) 2

14. **The electric wires first into a box in our homes called______ unit.**
    a) domestic b) consumers
    c) basic d) electricity

15. **Circuit breakers are used to_____ in case of more current flow.**
    a) avoid fire
    b) avoid electric shock
    c) avoid appliances damage
    d) all of above

16. _____ is used to carry electric charge from appliance casing to earth

a) neutral wire b) fuse
c) live wire d) earth wire

17. Voltmeter is made using______.

a) ammeter b) Manometer
c) galvanometer d) none of these

18. Which of the following is not contained by consumers unit?

a) fuse b) electric heater
c) switch d) circuit breaker

19. _____ is a safety device.

a) EBLE b) ELCB
c) ELBE d) BCLE

20. Unit of resistance is:

a) ampere b) volt
c) ohm d) farad

Answers:

1. d	6. b	11. d	16. d
2. a	7. d	12. d	17. c
3. c	8. a	13. c	18. b
4. d	9. d	14. b	19. b
5. a	10. a	15. d	20. c

Fill in the blanks and True or False questions are not included in the examination paper. However the same are being given for Memory Test of students.

a. *Fill in the blanks:*

1. An electric current is the flow of _____ charge.
2. The electric current is produced when _____ or _____

charges move.

3. An electric current is measured in _____.
4. The quantity of energy supplied by source to each unit of electric charge is called _____.
5. Voltage is measured by a _____.
6. The opposition of a conductor against the current in a circuit is called as ____of conductor.
7. Poor conductor offer_____ resistance to electric current.
8. A resistance changes ______ energy into heat.
9. Electrical components, which have resistance, are called_____.
10. Resistance of a resistor can be measured in _____.
11. It is found that current in an electric circuit increases with the increase in ____ in a circuit.
12. According to ohm's law the current in a conductor is proportional to _____ across the conductor.
13. A capacitor is a ____ strong device.
14. The capacitance of a capacitor is measured in _____.
15. Capacitors are used for connecting _____ circuit.
16. A simple transformer consists of _____ coils.
17. In most of the transformers a soft______is used as core.
18. The number of times the current changes its direction is called its_____.
19. The AC we use in our homes has a frequency of ___ Hz.
20. The need to use high voltage, source can be met if we use_____.
21. A short circuit is a path of_____ resistance.
22. Water may not be a very _____ conductor of electricity.
23. Electric current is measured by instrument called ______.
24. Electric current can be defined as quantity of charge flowing _____second.
25. Every conductor is _____ for different conductors.

26. A circuit breaker breaks the circuit by _____.
27. A large current _____ the fuse in circuit.
28. An ammeter is basically _____.
29. A galvanometer is used to measure very _____ current.
30. R is called ____ of conductor.
31. The charge stored on a capacitor depends upon the ____ given across the plates of a capacitor.
32. When a current is flowing in a circuit, _____ of circuit slows down the motion of charges.
33. A third ___ wire is used in the connection of different appliances with metallic casing to avoid any danger.

Answers:

1.	electric	18.	frequency
2.	positive, negative	19.	50
3.	ampere	20.	AC
4.	voltage	21.	low
5.	voltmeter	22.	good
6.	resistance	23.	ammeter
7.	greater	24.	per
8.	electric	25.	different
9.	resistors	26.	tripping
10.	ohm	27.	blows
11.	voltage	28.	galvanometer
12.	voltage	29.	small
13.	charge	30.	resistance
14.	farad	31.	voltage
15.	electronic	32.	resistance
16.	two	33.	earth
17.	iron	34.	

b) Indicate the True/False Statements:

1. The current is due to the flow of electrons only.
2. The insulators are the substances through which very small amount of current flows.
3. One ampere is equal to one hundred mili-amperes.

4. An ammeter is connected across the two end of the battery.
5. An ammeter is used to measure electric current.
6. The electric energy is stored in the form of chemicals in electric cells.
7. Voltmeter is used to measure the potential difference.
8. For the measurement of voltage a voltmeter is applied across the two points of which voltage is to be measured.
9. The measuring unit of resistance is farad.
10. Ohm is the measuring unit of resistance.
11. The total resistance increases if resistors are connected in series.
12. The ammeter and voltmeter can not be applied at the same time in a circuit.
13. If the resistances are connected in parallel combination the equivalent resistance is enhanced to many times.
14. The resistance in a resistor is due to the collisions of its atoms with the electrons.
15. The electricity reaches to our homes in the form of AC current.
16. The local cells produce DC current.
17. Capacitors are the devices that produce electricity through chemicals.
18. We use 440 volts of voltage at home.
19. For an electric shock a voltage of 50 volts is must.
20. As water is a good conductor of electricity so a person with wet body cannot be shocked.
21. Earth wire is used to supply the current from one appliance to other.
22. A sudden high electric current from the house wiring may cause fire.

Answers:

1. False	9. False	17. False
2. False	10. True	18. False

3. False	11. True	19. True
4. False	12. False	20. False
5. False	13. False	21. False
6. True	14. True	22. True
7. True	15. False	23.
8. True	16. True	24.

c. *Identify and label the following figures:*

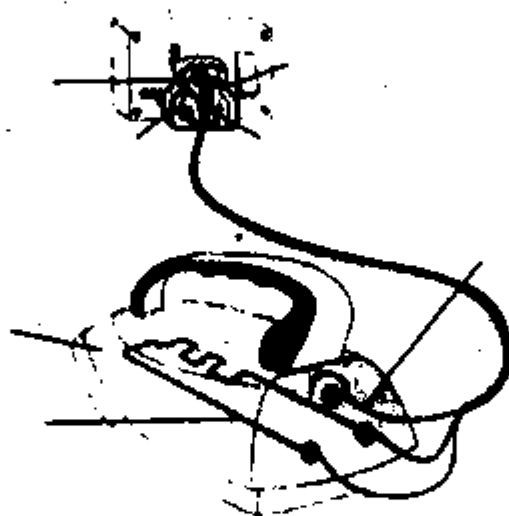
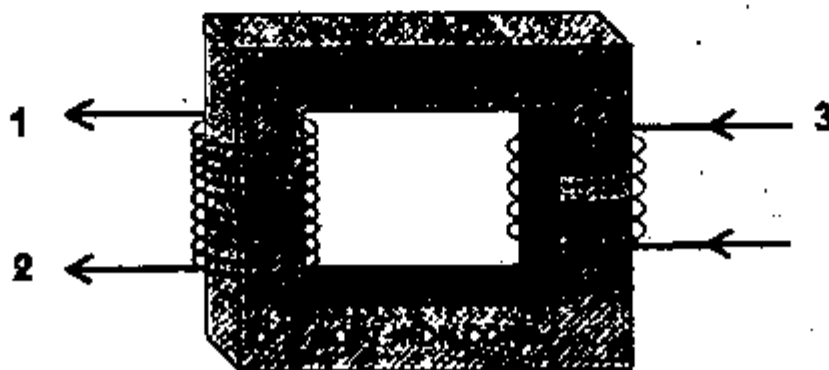



Figure 1:

Figure 2:

(xiii) Identify the following diagram. Write down the names of its parts labelled 1, 2, and 3, on your answer book.

10 Science and Technology

Section-I

Introduction to Chapter

Contents: This chapter deals with the following topics.

- Definitions Of Science And Technology.
- History Of Science.
- Recent Achievements And Advancements In Science.
- Laser And Laser Technology.
- Laser Machine And Its Working.
- Laser Applications.
- Satellites, Types And Uses.
- Radar And Its Uses.
- Radioactive Elements And Basic Concepts Of Radioactivity.
- Radioactivity And Its Peaceful Uses.
- X-Rays.
- Ultrasound.
- ECG, EEG, MRI And CT Scan Technologies And Their Importance.

Section-II

Comprehensive Questions with Answers

1. Give a brief history of science and technology.

Ans: Work on science and technology started even at the start of human age. Man started to use natural resources in their good way if not best using their intellect.

Muslim Era: The Muslim's era consists of eight to eleventh century. A lot of advancements were done in this era in the fields of science and technology. The rules and principles formulated by Muslim scientists supported were and patronized the development and propagation of knowledge. Muslims did great promotions in science and technology and translated the literature from Greek into Arabic. They worked on chemistry, mathematics, astronomy, physics, medicine and psychology. There is a significant role of Muslim scientists in the formation of basic principles of modern developments in science and technology.

Dependence On Handy Crafts: The main activity of man was the agriculture and handicrafts including boats, ships, bridges, buildings, wood work, weaving cloth, making pots to store food and water, simple tools like weapons, agricultural tools, animal driven carts, paper manufacturing, printing etc. All of these practices were done in the seventeenth century. Because all of these things were made with hands so their availability in large quantities was also a problem.

Use of Natural Resources: Man of that age was not aware of the actual potential of various natural resources. Windmill and watermills were used at some places for corn grinding and water pumping.

2. Give an overview of the advancements in science and technology.

Ans: Much advancement took place in science and technology since previous few centuries.

Eighteenth Century:

In this century following advancements took place.

i. New scientific laws were discovered.
ii. Many inventions took place.
iii. Steam engine run by coal was invented. It was a great success in the field of science and engineering at that time. It brought a revolution in technology.

Nineteenth Century:

The achievements of this century are:

i. Internal combustion engine was invented.
ii. Generation of electrical energy was started.
iii. Man leant to fly in air.

Many industries were started in which above technologies were used.

Twentieth Century:

Man did great development in the fields of science and technology during this century. He progressed in the fields of space technology, electronics, nuclear energy, transplantation, telecommunication, computers, genetic engineering, plastic industry, automation and plant and animal sciences.

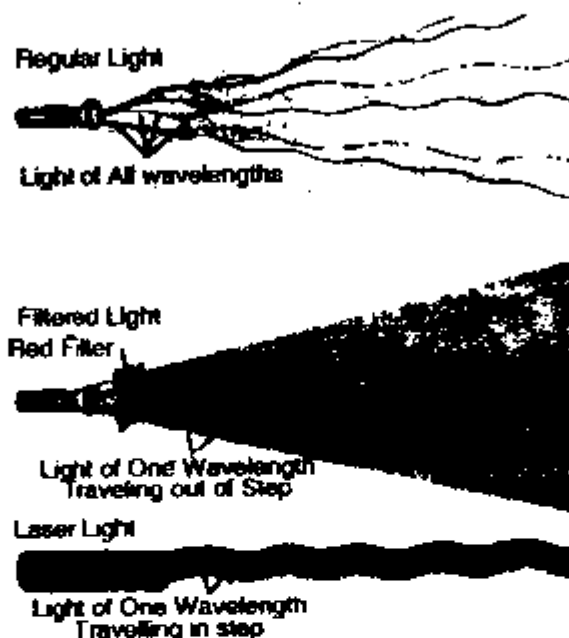
Modern Technology: Much advancement took place in the last decade of the twentieth century. Many products have been produced which have entirely changed the life style of people. Every individual of the world from developed to under developed countries have been benefited from the modern technology application.

Major Technology In Developed Countries: Major work on science and technology is being done in the countries like U.S.A, Japan, Russia, China, France etc. and benefiting their nation both with the fruits of new discoveries and the foreign exchange that they got by exporting their products to other nations. Other countries of the world are also trying to benefit their nations with the fruits of the modern technology.

3. **What is LASER? How does it work?**

Ans:

LASER:

Meanings of Word: The world LASER is the abbreviation of "Light Amplification by Stimulated Emission of Radiation". It is named after the process taking place inside the LASER tube.

A comparison of light of different origin

Invention: A scientist called Ruby prepared first laser in 1960. So this technology is not old.

Types of laser: Many types of lasers have been discovered like liquid laser, gas laser, semiconductor laser, pulse laser, continues laser etc. The colour of lasers also varies.

Laser Light: The laser light is an intense beam of light consisting of a very pure colour. It travels in one direction with very little deviation of light waves. These properties of laser have made it possible to use laser in the following purposes.

<u>**Uses:**</u> The lasers are used for the following purposes.

i. Laser is used for drilling the holes in metal plates.
ii. They are used in sensitive eye operations.
iii. They can possibly be used for the safe landing of aeroplanes.
iv. Laser guided missiles are made using this

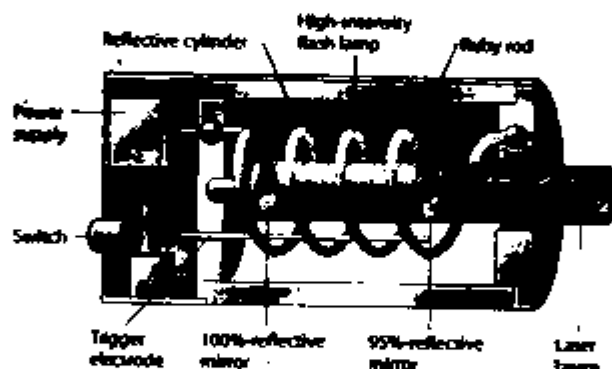
technology.

v. Lasers are also used in the telecommunication.

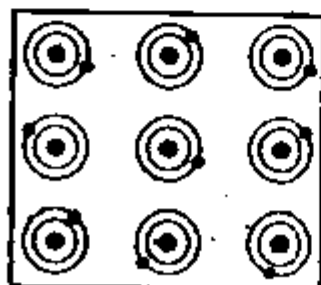
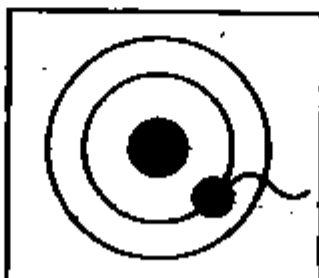
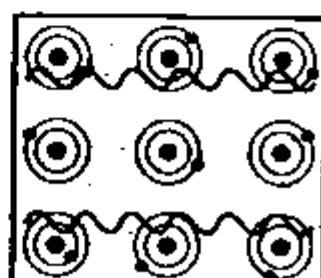
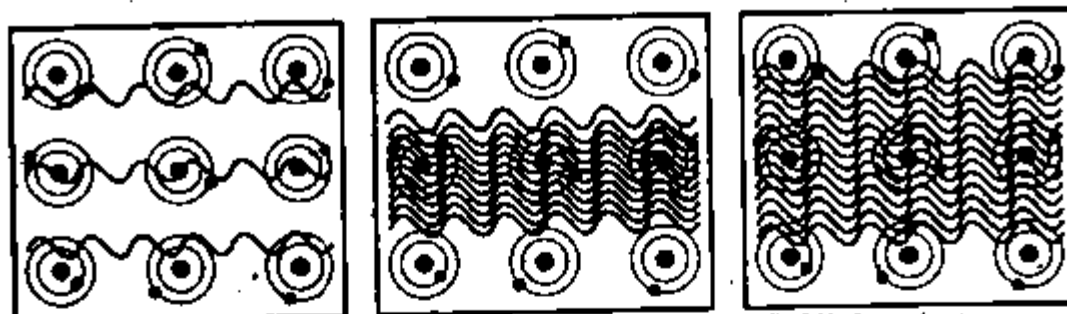
vi. They are used for the reading and recording the data on a computer compact discs (CDs).

Laser Machine and Its Working:

A specific machine is used for this purpose. The first laser was a solid laser. Its details are given as under:

Structure: It consists of a crimson red coloured ruby crystal. The rode of ruby crystal has two plane opposite surfaces which were made parallel and polish as a mirror for the purpose of reflection. One of the mirrors was made completely reflecting and the other made partially reflecting so that some of the light passes through it during the laser process. A flash tube is provided around the ruby rod.

The first laser, ruby laser uses a ruby rod with mirrors and Xenon flash tube

Working: Following steps are involved in the laser operation.

Excitation of Atoms: The ruby atoms get extra energy from flash tube and most of them are excited to the higher energy states.

(a) Excited atoms

(b) An excited atom gets de-excited

(c) A photon de-exciting other excited atom

(d) Excited atoms Being de-excited by a photon

(e) More and more photon joining the laser beam

(f) All the photons are of the same wavelength, all in step travelling in the same direction

De-excitation: The excited atoms are de-excited and come into their ground state releasing the extra energy which was absorbed from the tube as photons of red light. When a photon is released parallel to the ruby rod, it initiates the laser process causing de-excitation of other atoms.

Stimulation By Released Photons: Many photons of the same frequency travel in the same direction. When these photons go to the completely reflecting mirror they are all reflected back. After reflection each photon de-excites another atom. In this way the back and forth movement of photons causes the release of many photons of same frequency thus forming an intense beam of light. Some of this intense light comes out of the partially mirrored surface of ruby rod as laser. It is a highly energetic beam of light because all the waves in this beam are of same frequency.

4. What are the applications of laser in different fields of life?

Ans: Laser is one of the very important discoveries of modern technologies. It is applied in almost every field of life of modern age. The use of laser in different fields in discussed in detail as follows.

Medical field:

A doctor of optometry is examining a patient

Laser has gained great importance in medical. It is used in various surgical operations like:

- i) The doctors for the cutting of a body part use it without touching any other part of the body.
- ii) When it is concentrated on a point it produces heat. This heat is used up for the cleaning and sealing the area by boiling away the blood, tissues and germs.
- iii) Laser is used to weld the retina of eye back to the eye wall in case of its detachment in very small instant of time. If the retina remains detached from the eye wall it may cause total blindness.

The Holography (3-D Photography):

Holograph: "A holograph is photograph with three dimensional image showing a scene from different angles".

These holographs are being used in laser technology.

Military Applications:

It has following uses in military.

- i) It is used in range finders for the accurate location of the enemy position. These range finders are also used for civil purposes like ground surveys.

ii) It is used in the laser guided missiles used for the destruction of enemy's air crafts and tanks.

Computers:

There are following applications of laser in computer field.

i) Laser is used to read and store the data on compact disks (CDs).
ii) It is used in printers.
iii) It is used in the special type of scanners. These lasers are used at the check out points in the large stores.

Cutting and Welding:

In this case the heat produced by the laser is used in following ways.

i) The metal sheets are cut into pieces.
ii) Different metal pieces are joint together using the heat of laser.
iii) Fabrics of fifty or even more suits can be cut by laser at a time.

Space Technology:

As the laser light travels in a straight line so the astronomers place mirrors on the surface of moon. When laser is directed to the moon from earth on these mirrors it is reflected back to earth. This practice is done for the accurate measurement of the distance of moon from earth.

Optical Fibre System:

This system provides a chance to make light travel from any path either curved or straight. A specified mechanism is involved in this system.

Mechanism: In this system a glass fibre is used. The light ray enters from one end of the transparent glass rod and flows through thin glass fibres due to total internal reflection. When bundle of several thousands of the fibres are tapped together a flexible light pipe is formed.

Use of Optical Fibre: They are used in following ways.

i) In medical surgery the optical fibres are used to get an image of some internal organ of the body.

ii) They are used in the telephone cables for the carrying of pulses of laser light consisting of information.

Preference of Optical Fibres:

Optical fibres are preferred over the copper cables due to many reasons.

A strand of fibre optic cable

i) **Less Space Consumption:** The optical fibres cover very less space due to fewer diameters.

ii) **More Information:** As the frequency of light is millions of times greater that the frequency of electric signals so by the use of laser light millions of times more information can be sent in a particular time.

iii) **Electrical Faults:** The electrical faults and disturbances disrupt the messaging in electrical cables like copper cables but have no effect on the laser light in optical fibre carrying messages.

5. Write a detailed note on satellites.

Ans:

Satellites:

These are the artificial objects which are designed to revolve

around the earth. There are many types of satellites like telecommunication satellites, navigational satellites, surveillance satellites, research satellites and deep space probes.

Telecommunication Satellites:

These satellites complete one revolution around the earth in less than 24 hours. The position of these satellites changes with respect to the station on earth with which they are linked.

Telstar, a communication satellite

Surveillance Satellites:

These satellites can be placed in the geo-stationary or in the lower orbits.

Placement in Geo-stationary: The placement of the satellites at this place provides a continuous coverage of lower and middle latitudes. These information is very useful for the weather satellites to predict about hurricanes, typhoons etc.

Placement in Lower Altitude: It gives coverage of higher latitudes and Polar Regions. These are used for the periodic mapping of weather and earth resources.

Use in Military Operations: These satellites may also be used to watch the military activities like the collection of information about the movement and placement of military

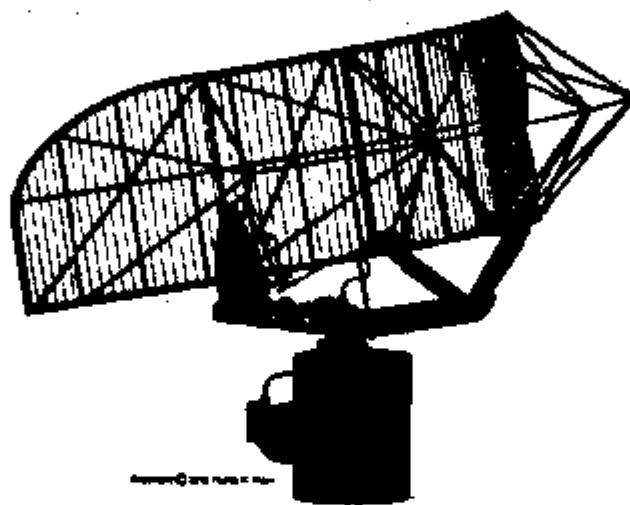
troops and installations. The data collection in this case may involve infra-red or visual images.

Research Satellites:

These are used to study various scientific phenomena like cosmic rays and magnetic field of earth.

Examples: MIR, Skylab.

6. What is RADAR? Discuss its elements and uses.

Ans: **Word's Meanings:** The word radar is the abbreviation of Radio Detection And Ranging.

A Radar antenna

Uses of Radar: Radar is used in numerous ways like;

a) It is used to detect the direction and distance of an object.
b) It can be used to detect the preference of the object.
c) It is regular equipment in the aircrafts for the provision of navigation. This is because it is not affected by the poor visibility and darkness.
d) It in used for aiming guns to ships and aircrafts during war.
e) It can be used for bombing and hitting direction guided missiles to ships and cities.
f) They can be used for the warning of approaching aircrafts.
g) They are used to the night fighting aircrafts for the

location of attacking enemy's aircrafts.

h) They are used for the safe landing of aircrafts in bad weather conditions.
i) They can be used for the monitoring of air traffic.
j) They enable the aircraft to terminate its height above the ground.

Elements of a Radar System:

It consists of two systems i.e.

a) **Transmitting System:** It consists of a radio frequency oscillator which is controlled by a modulator or pulsar. It produces periodic pulses of high power for short duration. Antenna is used for the transmission of these pulses.

   The Antenna: It can be rotated for the dispersal of beam in the required direction. The working of the radar highly depends on the direction of this antenna. Mostly a single antenna is used both for transmission and reception.

b) **Receiving System:** It is like radio receiver where the output is received and displayed on a cathode ray tube. The time difference between the outgoing and returning pulses gives the distance of the object from the radar system.

7. What is radioactivity? Discuss different types of isotopes.

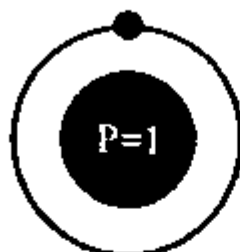
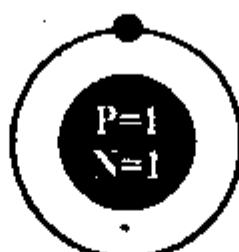
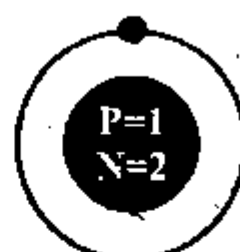
Ans:

Radioactivity:

"The emission of radiations from the atoms of some heavy metals is called radioactivity".

Discovery of Radioactivity: The radioactivity was first observed by a French scientist Henri Becquerel in 1896. He exposed a photographic film in front of a sample of uranium salt. The photographic film was affected in such a way that if it was exposed to the light. This indicated that some radiations are being emitted from the uranium.

Isotopes:

"The isotopes of an element are its atoms having the same atomic number but different mass number".

Isotopes of Hydrogen atom

Explanation: The isotopes have different mass number because they have different number of neutrons in their nuclei. Because of the same number of protons and electrons the isotopes of an element have same number of atomic number. Most of the isotopes are natural but some isotopes have been prepared in the laboratory.

Examples: There are many elements which have isotopes like:

- **i)** Hydrogen has three isotopes i.e. protium (having one proton and no neutron in the nucleus), deuterium (having one proton and one neutron in the nucleus) and tritium (having one proton and two neutrons in the nucleus).
- **ii)** Chlorine has two isotopes with the mass numbers of 35 and 37.
- **iii)** Silver has two isotopes with mass numbers of 107 and 109.
- **iv)** Tin has ten isotopes.
- **v)** Uranium has three isotopes with mass numbers of 234, 235 and 238.

Stable Atoms:

The atoms that do not disintegrate into the atoms of other elements are called stable atoms.

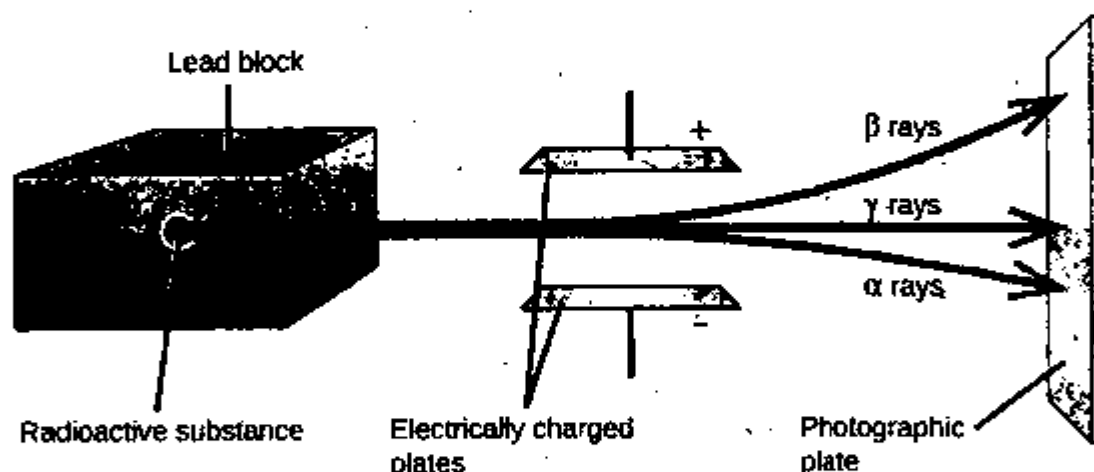
Examples: Iron, Copper and Gold etc.

Unstable Atoms:

These are the atoms of some elements that disintegrate into the atoms of other elements giving out radiations. Henri Becquerel discovered these atoms in 1896. These elements have an atomic number more than 82.

Examples: Uranium, Radium and Thorium etc.

Radioactive Elements:

These elements are also called as natural radioactive elements because they disintegrate and radiate spontaneously in nature. These elements have an atomic number more than 82.

Radiation from a radioactive sample

Nuclear Radiations:

"The radiations emitted by the radioactive elements are called nuclear radiations". These are of three kinds on the basis of their particle mass, speed, charge carried and physical nature. These are:

a) Alpha Rays

b) Beta Rays.

c) Gamma Rays.

Artificial or Laboratory Made Radioactive Elements:

Instead of the naturally occurring radioactive elements there are some elements which are artificially prepared by the bombardment of some particles like neutrons, alpha particles etc. This gives new elements that are not found in nature. These elements are heavier than uranium. Some of these are:

Element	Atomic Number	Mass Number
Neptunium	93	237
Plutonium	94	242
Americium	95	243
Curium	96	247
Berkelium	97	247
Californium	98	251
Einsteinium	99	252
Fermium	100	257

8. What are radioisotopes? Discuss their uses in various fields of life.

Ans:

Radioisotopes:

"The isotopes of an element that emit radiations are called radio isotopes".

Explanation: The radioisotopes are either natural or artificially prepared in the laboratory.

Laboratory Radioisotopes:

The radioisotopes are prepared by the bombardment of neutrons on a particular element in the nuclear reactor. The isotopes thus formed are unstable isotopes.

Example: When ordinary cobalt captures neutrons it is converted into a radioactive isotope i.e. cobalt-60.

Uses of Radioisotopes:

The radioisotopes are used in many fields like medicine,

agriculture, basic science, industries etc.

Use of Radioisotopes In Medicine:

These isotopes have many uses in medicine like:

a) **Disease Diagnosis:** These are used for the identification of tumours. Introducing a minute quantity of the radioisotope into the blood does this job. Blood then carries it to the desired part of body from where the emitting radiations give an estimate of the damaged area.
b) **Diagnosis of Cancer:** The radioactive isotope gallium 67 is injected into the blood stream of the patient. The isotopes preferably go into the tumorous tissues of the body thus increasing the radioactivity in the Lymph Region of throat and neck. This shows the location of cancer in the patient in this area.
c) **Cancer Treatment:** Cobalt-60 is used for the treatment of cancer of thyroid gland.
d) **Leukaemia Treatment:** Phosphorous-32 is used for the treatment of Leukaemia.

Use of Radioisotopes In Agriculture:

The radioisotopes have numerous uses in agriculture like:

a) **Fertilizer Uptake:** The radioisotopes are used for the determination of fertilizer uptake by the plant. This is done by introducing a radioactive nutrient in the fertilizer and then detecting the radiations emitted from different parts of the plant like leaves.

Radio auto-graph of coleus leaf showing distribution of radio phosphorus fed to the plant.

b) **New Crop Varieties:** The radioisotopes are used for the evolution of new varieties which have good characters like higher yields, better quality produce, early maturity, greater resistance to diseases and insect pests.

c) **Age of Rocks:** Presence of carbon-14 is used to determine the age of rocks and dating of organic remain found on rocks.

d) **Genetic Mutations In Livestock:** The radioisotopes are used to do mutations in livestock for getting new improved characters for getting new breeds.

Use of Radioisotopes In Industry:

In this case they have following uses.

a) **Detection of Leakage:** The radioisotopes are used for the detection of underground leakage and the position of underground pipes.

b) **Detection of Machine Faults:** The radioisotopes are used for the detection of internal cracks, defects and faults in the machine parts.

9. What are x-rays? Discuss their uses.

Ans:

X-Rays:

"X-Rays are the radiations emitted when a metallic target is bombarded with high speed electrons in the x-ray tube",

**Airport security machine use
low energy x-rays to check luggage**

Properties of X-Rays:

a) The energy of x-rays is thousands of times greater than the energy of light waves.

b) X-rays can pass through some materials like wood, clothes, nylon, thin aluminium sheets and plastics.

c) They can pass through the soft body parts.

d) These radiations cannot pass through the some materials like bones, teeth and some metal sheets like iron, copper, lead etc.

Uses of X-Rays: X-Rays have numerous uses in different fields such as:

a) These rays are used at airports for checking of luggage without opening it.

b) As the teeth and bones stop the x-rays therefore doctors used them to photograph cavities in the teeth, thin crakes, fractures in bones, deformation of bones, tumours and lung diseases.

c) The x-rays are used for getting a detailed bony structural photograph. This is because the bones are mainly composed of calcium. This is because these rays easily pass through the tissue structure because these tissues do not have any calcium in the discs and nerve tubes.

10. What is ultrasound? Discuss different techniques used in medical field.

Ans:

Ultrasound:

"These are high frequency sound waves of above 20 KHz., produced by vibrating the quartz crystal to the required frequency".

Uses of Ultrasound: These have use in many fields.

a. These sound waves are used in the measurement of depth of sea, detection of the objects under water and also used in industry.

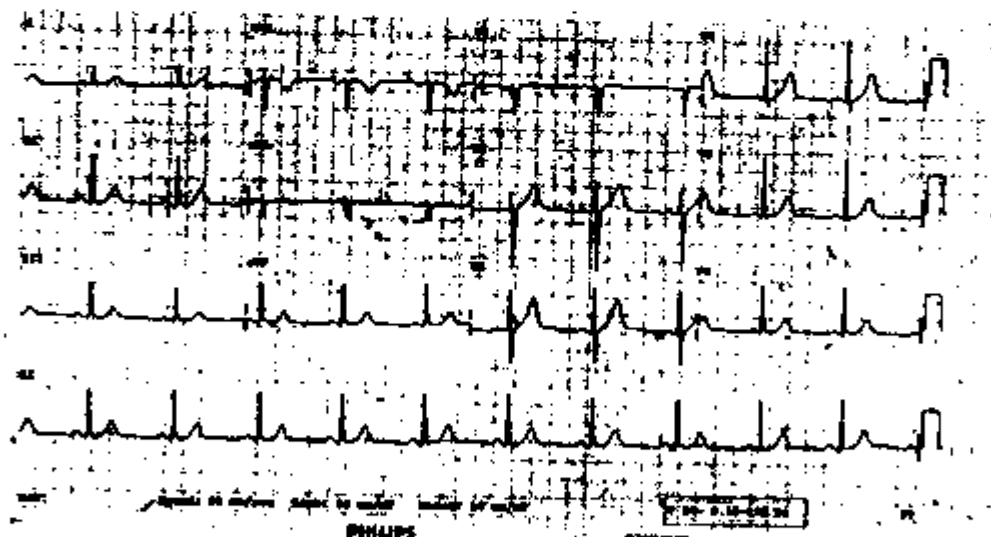
b. The ultrasounds are harmless and produce no after effects so they are used in medical for the diagnosis of diseases.

c. They are used in the gynaecology and cardiology procedures.

d. They are used in the examination of kidneys, heart, blood vessels, gallbladder, pancreas and kidneys. The examination of heart is called echocardiography.

e. Source of pain, swelling and infection of different body parts can be determined by the use of these sound waves.

Electrocardiography:

"It is the procedure through which the physicians obtain a graphical record of electrical activity of heart".

An electrocardiograph (ECG or EKG) records the electrical activity of the heart.

Explanation: Through this procedure, rhythmic heat beat is maintained. It is done by an orderly series of electrical pulses originating in the series node of the right atrium and proceeding through the atriventricular node and the bundle of neuromuscular fibres to the ventricles. The record thus obtained by the attacking electrodes to various parts of body is called electrocardiogram or ECG.

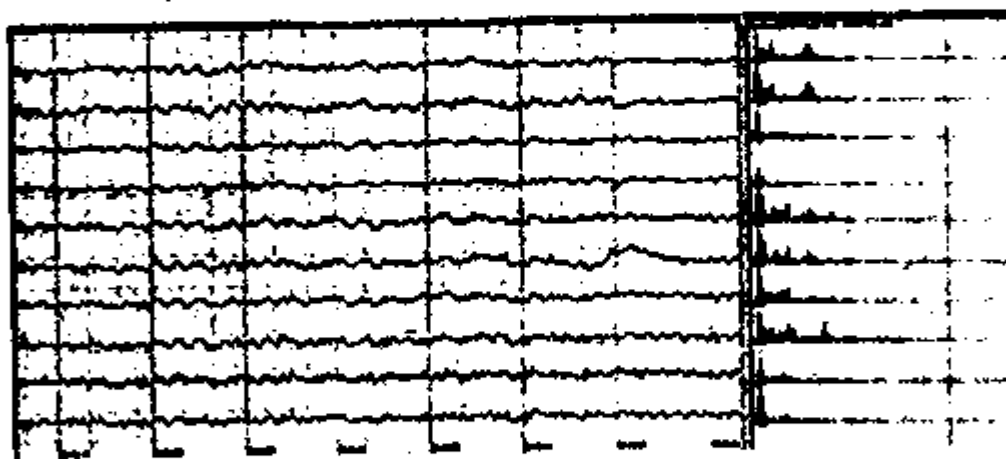
Use of ECG:

i) The graphical activity of heart is recorded by this procedure. So it can be very helpful in the determination of heart attack or abnormal heart rhythm.

ii) The bioelectrical functions of the body are monitored by means of electrodes.

iii) The uses of electrodes are important components of surgical recovery rooms and intensive care units for their use for many medical purposes.

Electroencephalography:

"It is the procedure of using disk shaped electrodes taped on to the scalp for recording electrical activity of the brain".

A normal electroencephalograph (EEG) pattern

Uses of Electroencephalography:

a) As the electrical signals fluctuate with the time so their voltage is shown by this procedure.

b) A patient's response to a sensory stimulus is determined.

c) This procedure is used for the determination of person's level of physiological arousal.

d) Epilepsy is diagnosis by the use of this procedure. The damaged site of brain can be identified by the EEG tracing.

e) It is used in the research for nature of sleep and studying the four stages of sleep.

f) Various parts of brain carrying out different functions are identified by their use. It is done by the analysis of brain wave stimulated by sensory input like the flash of light or sound.

g) The flat or waveless EEG is used as a legal evidence of death.

h) The flat or waveless EEG showing that the brain is functionless can identify coma.

Magnetic Resonance Imaging (MRI):

It is the procedure of producing high quality three-dimensional images of the internal organs of human body.

A patient being examined by MRI

Mechanism: The hydrogen nuclei produce nuclear magnetic resonance (NMR) signals. As our body mainly consists of fats and water of which hydrogen is the main component. Therefore the NMR signals from hydrogen nuclei are recorded for the imaging.

MRI was first started out as an atom graphic imaging technique for the production of image in thin slice through the human body using NMR signals.

A magnetic Resonance Imaging (MRI) scan showing the brain, airways, and soft tissues of the face.

Diagnosis: This procedure is used for the diagnosis in various situations such as:

a) Disorders like those of musculoskeletal and joints.

b) Diseases of bones like knee, shoulder, spine, hips, wrists and hands.

c) Diagnosis of brain tumour.

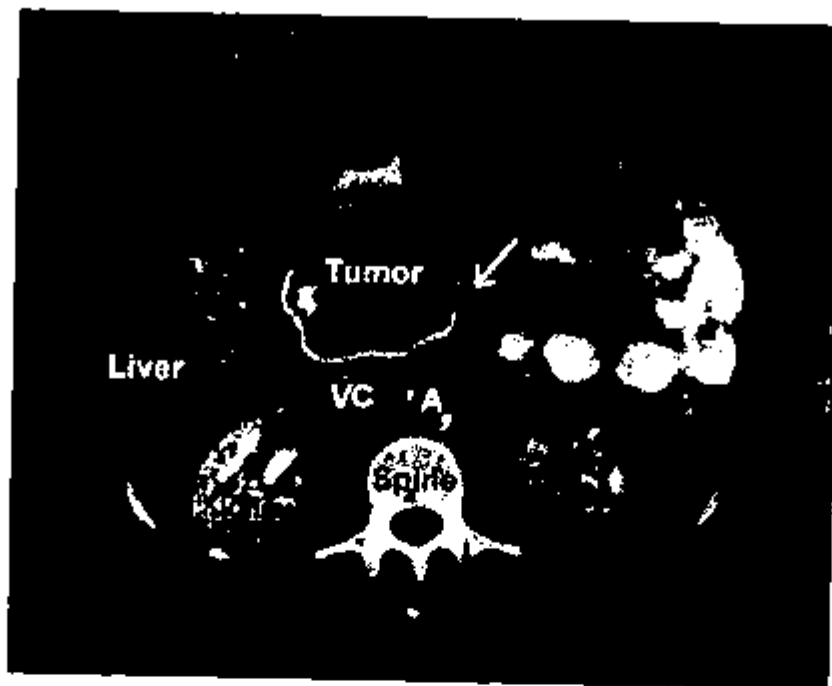
d) Cancer in various parts of body

e) Eye disorders

f) Disorders of inner ear

g) Stroke and heart diseases

Computerized Tomography (CT Scan):

Working Mechanism: In the CT scan x-rays beam is shooted through the body to get a cross section of the body. This image is then reformed in the computer which is present next to the body. The process is repeated at different intervals.

A CT Scan

Uses of CT Scan:

a) A cross section image of the spinal canal can be obtained for specific conditions as a result of the multiple view of CT Scan.

b) Excellent body details showing any fractures in the body can be assessed by CT Scan.

c) It is used to see the tissues of brain. This indicates that either an accident victim has sustained the injury or not.

d) The brain studies by this procedure also indicate that weather bleeding is occurring from the brain of a stroke victim.

e) This procedure is used for the diagnosis of disorders like chest, abdomen, spine, and pelvis.

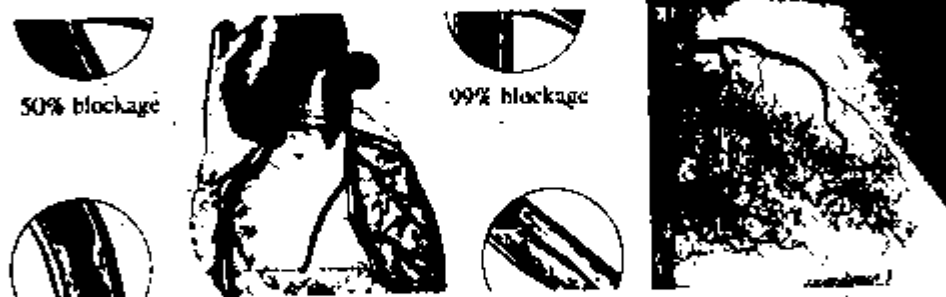
f) It is used for the location and size of cancerous tumours.

g) It is also used to detect the spread of cancer in other body parts.

Angiography:

CT angiography is an application of CT. By the use of this technique detailed images of blood vessels and hollow structures lie colon and airway of lungs from interior are obtained.

Coronary Angiography: In this case the presence and extent of coronary disease is detected by the x-ray examination. The main coronary artery appears as a yellow ribbon across the heart.

Procedure: A radiopaque dye or constant medium is injected into the blood and then the coronary artery is examined through x-ray. The path of artery appears as dark spots due to the blockage caused by athero scierotic plaque. This gives an angiogram showing the blockage in the coronary artery along the upper surface of the heart.

Angiography

11. Write a note on the important industries of Pakistan.

Ans: Pakistan is an agricultural country and two third of its population is directly or indirectly related to agriculture so industry is not developed here. It is very important to invest in this field.

Need to Develop Industry: There is big need of developing industry in our country. The development of industry for the prosperity of our nation. Pakistan has great potential for the development of industry. There is a great need of spreading the existing industry as well as establishment of new industries.

Main Industries of Pakistan: Main industries of Pakistan are cement, sugar, steel, pharmaceuticals, synthetic fibre, textile

and leather etc.

Cement Industry:

It is also called Portland Cement. It is used in the construction of buildings, bridges, dams, streets surfacing, footpaths etc.

Raw Materials: There are two raw materials used in the formation of cement i.e. limestone and clay.

Procedure of Cement Formation: It involves following steps.

a) Clay and limestone are ground together and mixed well.

b) The mixture of clay and limestone is heated by very hot fire in rotary kilns.

c) The resulting product is crushed to fine powder.

d) For the proper drying and setting some amount of gypsum is also added. The resulting powder thus formed is cement.

Scope In Pakistan: Raw material for this industry is abundantly available in Pakistan. Total cement production in Pakistan is 16000 tons per year from all the twenty-five cement factors.

Main Cement Factories: Main cement factories are present in Taxila, Gharibwal, Karachi, Hyderabad, Cherat and Sikandarabad.

Sugar Industry:

Sugars is the term denoted for sweet forms of carbohydrates. The basic sugar is glucose. It is the form of sugar which is actually burnt in our body cells for the production of energy. The sugar which we use at our homes is sucrose.

Sources: The major sources used for industrial manufacturing of sugar are sugarcane and sugar beet.

Extraction of Sugar: In Pakistan sugar is mostly obtained from sugarcane that involves many steps i.e.

a) **Juice Extraction:** The sugarcane is shredded and crushed using rolling machines to obtain juice.

b) **Filtration:** The juice thus extracted from the sugar cane is purified by filtration.

c) **Vaporization:** The final filtrate is then taken to the large tanks for boiling and vaporization of the access of water.

d) **Removal of Impurities:** The impurities are removed from the final product by the addition of lime and carbon dioxide.

e) **Centrifugation:** Finally the centrifugation is done for the separation of sugar crystals from the solution.

Scope of Sugar Industry in Pakistan:

Total Industries: Pakistan has more than 78 sugar factories.

Total Production: Pakistan is producing about two million tons of sugar. This production is more than the need so extra amount of sugar is being exported for the earning of foreign exchange.

Steel Industry:

Chemical nature of Steel: Steel is an alloy of iron and carbon.

Process of Formation: Conversion of iron into steel need furnaces. Many types of furnaces are used for this purpose. The formation of steel involves several steps. Some of other elements are mixed with the iron. It is done to give some special characteristics to steel. Carbon is added to increase its hardness. Chromium, nickel and tungsten are added in it in small amounts. Stainless steel is one of its forms in which chromium is mixed with iron.

Properties of Steel:

i. The most important property of steel is that it is rust free.

ii. Steel is not costly.

iii. It is of great strength.

Uses of Steel: Steel is used for many purposes.

a) It is used in the tools used for the cutting of hard metals.

b) It is used for the structuring of automobiles and trains.

c) It is used as a construction material in bridges, buildings etc.

Scope In Pakistan: Pakistan has steel mill at Karachi called "Karachi Steel Mill". It was established in 1973 with the help of Russia.

Production: Annual production of Karachi Steel Mill is over one million tons of steel.

Allied Industries: Steel industry has more importance because many of other industries depend on it. The prosperity and development of a nation depends on the progress of this industry.

Pharmaceutical Industry:

"It refers to the manufacture of medicines and drugs to prevent and control the diseases".

Need: Development of this industry is required to fulfill the medical requirements of fast growing population. With the passage of time more dangerous and complicated diseases are coming on the seen. So this requires much advancements in this industry so in case of discovery of some medicine of a dangerous disease it mass production would be possible in short period of time.

Medicines: Main drugs being manufactured by this industry are antibiotics, steroids, hormones, vitamins and many drugs.

Need of Research: There is great need of research by individual scientists and organizations in this field so that to prepare the medicines from herbs and other plant sources.

Challenge: Most of the raw materials used for the preparation of medicines are imported from other countries. So the efforts should be done to establish the plants for the provision of raw materials. This will be useful in following aspects:

a) It will save precious foreign exchange.

b) It will create job opportunities for young scientists as well as general labour.

c) The prices of the medicine will be reduced.

Textile Industry:

The textile industry in Pakistan mainly includes cotton yarn, cotton fabrics, ready made garments, hosiery, towels, knit wear etc.

Basis In Pakistan: The textile industry in Pakistan is mainly based on raw materials of agriculture and minerals. Cotton locally produced in being used in the local textile industry.

Main Exporting Countries of Cotton: Cotton is mainly exported to Japan, United Kingdom etc.

Scope In Pakistan: In Pakistan it is the largest industry. It is one of the most important sectors of our economy. About 300 cotton textile mills are located in different cities mainly in Karachi, Faisalabad, Hyderabad and Multan.

Features of Textile Industry:

a) 60% of our exports include cotton, cotton yarn, cotton cloth, ready made garments towels and bed sheets etc.

b) This industry provides jobs to a great number of people of Pakistan.

c) There is great potential of this industry in Pakistan.

Synthetic Fibre:

There are many attempts which are done to prepare the synthetic fibre that resemble the cotton or silk obtained from silk worm.

Raw Material: The synthetic fibre is prepared from coal, petroleum and wool pulp.

Revolutions of Synthetic Fibre: The development of synthetic fibre technologies have brought revolution in the textile industry. It has helped in various ways like:

a) It has helped to decrease the cost of production in

textile industry.

b) The physical characters of synthetic fibre can adjusted according to the specific needs. This is not possible in case of natural fibres.

c) The countries which have to import cotton and silk from other countries for their local production are now able to synthesize their textile products merely by using their local resources.

d) The synthetic fibres can be manufactured in masses according to need. While the availability of natural fibres is also a problem.

Scope In Pakistan: Our textile industry mainly depends on natural silk and cotton but due growing popularity synthetic fibre is now also being produced in Pakistan.

Leather Industry:

It is an important cottage industry of Pakistan. The skins and hides are first obtained from the animals. After tanning these are used in the manufacture of many products.

(a) A view of leather cottage industry

(b) Leather products such bags as shoes, jackets etc. are popular in European and American countries

Leather Products: The main leather products being produced in Pakistan are shoes, sandals, leather hand bags, caps, jackets etc.

Exports: Main leather products being exported in the foreign

countries like Europe and America are leather jackets.

12. What are the factors on which the economic condition of a country depends? Explain with reference to Pakistan.

Ans:

Factors Affecting Economic Stability:

There are many factors on the economic stability of a country depends like the politics, society, cultural activities, availability and utilization of natural resources, the condition of industry, educational set-up and quality of training etc.

Natural Resources of Pakistan: Pakistan had very limited facilities at the time of independence but our forefathers realized the importance of natural resource development. They stressed on the progress and development of industry and agriculture. With the efforts of government and struggle of our scientists we have developed much in the sectors of agriculture and industry.

Strategic Importance of Pakistan: Pakistan is one of the stronger nations of the world. After 1998 it has gained the status of a nuclear power.

Policies of Pakistan: Pakistan has always worked on the policy of peace and good relationship with all the countries of the world including our neighbours. Our mission is to eliminate disease and poverty from the world by using the natural resources in the best way possible.

Solved Exercises of Text Book

1. Complete the following statements:

i. The most important discovery in the history of mankind was __________.

ii. Laser stands __________.

iii. In laser all photons have the same wavelength, travelling in the same direction and __________.

iv. Blindness may be caused by the __________

detachment from the walls of eyes.

v. Hydrogen has _________ isotopes.

Answers:

i)	electricity.
ii)	Light Amplification by Stimulated Emission of Radiations
iii)	pure in colour
iv)	retina
iv)	three

2. Tick (✓) the following statements either True or False:

i)	First laser was a gas laser.	False
ii)	Laser can be used in telecommunication.	True
iii)	The intensity of Laser beam goes on increasing during laser action as it moves back and forth between the mirrors.	True
iv)	Radioactive elements cannot be prepared.	False
v)	Iodine-131 is used for Thyroid gland.	False

3. Encircle one choice a, b, c or d in each case:

i) The number of neutrons that a hydrogen atom contains is:

a) 3 b) 2
c) 1 d) none

Ans: none

ii) The number of protons in Oxygen atom is:

a) 16 b) 14
c) 8 d) 6

Ans: 8

iii) The material through x-rays can pass is:

a) bones b) plastic
c) iron d) lead

Ans: plastic

iv) The number of steps of sleep which have been identified leg EEG is:

a) two b) three
c) four d) five

Ans:

v) Iron is converted into steel by adding:

a) nickel b) carbon
c) chromium d) zinc

Ans: carbon

4. Why ultrasound is preferred over x-rays?

Ans: Ultrasound is preferred over x-rays due three factors i.e. it is harmless at the time of application, it has no after effects and it gives more accurate and fast results. Another factor is that the x-rays are applied at small level while ultrasound is applied at large level like the determination of sea depth etc.

5. How do laser differ from ordinary light?

Ans: The laser light differ from ordinary light because unlike ordinary light, it travels in straight line, it contains one pure colour, wavelength of all the rays is same does not spread even after travelling for longer distances and possesses more energy.

6. How radioactivity is used in Hospitals?

Ans: Radioactivity is used in hospitals for diagnosis and treatment purposes. The diagnosis of cancer is done by the use of radioactive isotopes.

Disease Diagnosis: These are used for the identification of tumours. Introducing a minute quantity of the radioisotope into the blood does this. Blood then carries it to the desired part of body from where the emitting radiations give an estimate of the damaged area.

Diagnosis of Cancer: The radioactive isotope gallium 67 is injected into the blood stream of the patient. The isotopes preferably go into the tumorous tissues of the body thus increasing the radioactivity in the Lymph

Region of throat and neck. This shows the location of cancer in the patient in this area.

Treatment: The radioactive elements are used for the treatment of cancer of thyroid gland and Leukaemia.

7. Describe basic elements of a radar system.

Ans: **Elements of a Radar System:**

It consists of following elements.

Transmitting System: It consists of a radio frequency oscillator which is controlled by a modulator or pulsar. It produces periodic pulses of high power for short duration. Antenna is used for the transmission of these pulses.

The Antenna: It can be rotated for the dispersal of beam in the required direction. The working of the radar highly depends on the direction of this antenna. Mostly a single antenna is used both for transmission and reception.

Receiving System: It is like radio receiver where the output is received and displayed on a cathode ray tube. The time difference between the outgoing and returning pulses gives the distance of the object from the radar system.

8. What do you understand by CT Scan?

Ans: CT Scan stands for Computerized Tomography Scan. In the CT scan x-rays beam is shooted through the body to get a cross section of the body. This image is then reformed in the computer which is present next to the body. The process is repeated at different intervals.

9. Describe some important industries of Pakistan.

Ans: The important industries of Pakistan are cement industry, sugar industry, steel industry, pharmaceutical industry, textile industry, synthetic fibre, leather industry etc. Out of these textile industries is the most developed in Pakistan. In case of sugar we are also self-sufficient. Mainly we lack in the availability of raw materials for pharmaceutical industry.

10. Which machines are used at Airport security?

Ans: For airport security x-rays machine is used for the checking and scanning of passenger's luggage without opening it. If there is any explosive present in the luggage is detected by x-rays.

11. What is the importance of ECG?

Ans: ECG is a very important technique used in the medical field.

i) It is used for recording the electrical activity of heart.

ii) The graphical activity of heart is recorded by this procedure. So it can very helpful in the determination of heart attack or abnormal heart rhythm.

iii) The bioelectrical functions of the body are monitored by means of electrodes.

iv) The uses of electrodes are important components of surgical recovery rooms and intensive care units for their use for many medical purposes.

12. Name some of the diseases diagnosed by ultrasound.

Ans: Ultrasound is used for the diagnosis of source pain, swelling, infection, stones in kidneys, gallbladder, disorders of blood vessels, heart, pancreas and bladder.

13. How does energy build up in laser?

Ans: The energy is laser machine builds by the following procedure.

Excitation of Atoms: The ruby atoms get extra energy from flash tube and most of them are excited to the higher energy states.

De-excitation: The excited atoms are de-excited and come into their ground state releasing the extra energy which was absorbed from the tube as photons of red light. When a photon is released parallel to the ruby rod,

it initiates the laser process causing de-excitation of other atoms.

Stimulation By Released Photons: Many photons of the same frequency travel in the same direction. When these photons go to the completely reflecting mirror they are all reflected back. After reflection each photon de-excites another atom. In this way the back and forth movement of photons causes the release of many photons of same frequency thus forming an intense beam of light. Some of this intense light comes out of the partially mirrored surface of ruby rod as laser. It is a highly energetic beam of light because all the waves in this beam are of same frequency.

14. What is a holograph?

Ans: A holograph is photograph with three-dimensional image showing a scene from different angles.

15. What are some other uses of holograph?

Ans: A holograph might be sued for the diagnosis of disorders of the body with out operating it. A holograph gives a clear picture of the internal parts so the exact location of disorder can be found out.

16. What are optical fibres?

Ans: The optical fibres provide a chance to make light travel from any path either curved or straight. A specified mechanism is involved in this system.

Mechanism: In this system a glass fibre is used. The light ray enters form one end of the transparent glass rod and flows through thin glass fibres due to total internal reflection. When bundle of several thousands of the fibres are tapped together a flexible light pipe is formed.

17. Why laser communication is better than electrical signals through copper cables?

Ans: The laser communication is preferred over copper cables because of following reasons.

a) The optical fibres are faster in the transmission of

signals than copper cables due to high frequency.

b) The optical fibres cover less space.

c) In case of electric disturbance optical communication is less likely to be disturbed.

1. What is the role of Muslim scientists in different fields of science?

Ans: Muslims did great promotions in science and technology and worked in the fields of chemistry, mathematics, astronomy, physics, medicine and psychology. There is a significant role of Muslim scientists in the formation of basic principles in the formation of modern science and technology.

2. What was the main discovery of eighteenth century?

Ans: The most important discovery of eighteenth century was the discovery of steam engine. This steam engine was run by coal. It was a great success in the field of science and engineering at that time.

3. What is the contribution of developed countries towards the science and technology?

Ans: Major work on science and technology is being done by the developed countries like U.S.A, Japan, Russia, China, France etc. and benefiting their nation both with the fruits of new discoveries and the foreign exchange that they got by exporting their products to other nations.

4. What are the properties of laser light?

Ans: The laser light is an intense beam of light consisting of a very pure colour. It travels in one direction with very little deviation of light waves. So it can travel in through the distance of miles with very less deviation.

5. What is the mechanism of laser reaction?

Ans: The ruby atoms get extra energy from flash tube and most of them are excited to the higher energy states. When these come to ground state they release energy in the form of photons. These photons then stimulate other atoms for de-excitation thus releasing a large number of photons.

6. How laser is used in eye surgery?

Ans: Laser is used to weld the retina of eye back to the eye wall in case of its detachment in very small instant of time. If the retina remains detached from the eye wall it may cause total blindness.

7. What is a holograph?

Ans: A holograph is photograph with three dimensional image showing a scene from different angles. These are used in the laser technology.

8. What are the properties of optical fibres?

Ans: The optical fibres consume very less space, they can provide more information in a particular time because the frequency of electrical signals in this is very high as that in case of copper cables and they continue working in case of minor electrical faults.

9. How laser is applied for military purposes?

Ans: Laser is used in range finders for the accurate location of the enemy position. It is also used in the laser guided missiles used for the destruction of enemy's aircrafts and tanks.

10. What do you mean by isotopes?

Ans: The isotopes of an element are its atoms having the same atomic number but different mass number. This is because of different number of neutrons present in the nuclei of these atoms.

11. How many isotopes hydrogen has?

Ans: Hydrogen has three isotopes i.e. protium (having one

proton and no neutron in the nucleus), deuterium (having one proton and one neutron in the nucleus) and tritium (having one proton and two neutrons in the nucleus).

12. What are unstable atoms?

Ans: These are the atoms of some elements that disintegrate into the atoms of other elements giving out radiations. These elements have an atomic number more than 82.

13. What are satellites?

Ans: These are the artificial objects which are designed to revolve around the earth. According to their specific function in space the satellites can be divided into many types like telecommunication satellites, navigational satellites, surveillance satellites, research satellites etc.

14. What are nuclear radiations?

Ans: The nuclear radiations are the electromagnetic rays which are emitted from the atoms of radioactive elements. These radiations are alpha, beta and gamma. They differ mass, velocity, electric charge, penetrating power etc.

15. What are artificial radioisotopes?

Ans: These are the radioactive elements which are artificially prepared by the bombardment of some particles like neutrons, alpha particles etc. This gives new elements that are not found in nature.

16. Which are the fields where radioisotopes are used?

Ans: The radioisotopes are used in many fields like medicine, agriculture, basic science, industries etc.

17. What is the use of radioisotopes in agriculture?

Ans: The radioisotopes are used in agriculture for the development of new improved varieties giving more yield per acre, more resistant to pests and diseases, drought tolerant etc.

18. How nuclear radiations are applied in medicine?

Ans: The nuclear radiations are applied in medicine for the both the purposes i.e. diagnosis and treatment of diseases. Many incurable or complex diseases can be controlled by the radiations.

19. How the bone condition of the body can be seen with the help of x-rays?

Ans: The x-rays are used for getting a detailed bony structural photograph. This is because the bones are mainly composed of calcium. As these rays easily pass through the tissue structure because these tissues do not have any calcium in the discs and nerve tubes. In case of any fracture or damage to the bones, it can easily be seen.

20. How cancer can be diagnosed using radioisotopes?

Ans: The radioactive isotope gallium 67 is injected into the blood stream of the patient. The isotopes preferably go into the tumorous tissues of the body thus increasing the radioactivity in the Lymph Region of throat and neck. This shows the location of cancer in the patient where isotopes.

21. What are x-rays?

Ans: X-Rays are the radiations emitted when a metallic target is bombarded with high-speed electrons in the x-ray tube. These are high-energy electromagnetic radiations.

22. What is the scope of cement industry in Pakistan?

Ans: Raw material for this industry is abundantly available in Pakistan. Total cement production in Pakistan is 16000 tons per year from all the twenty-five cement factors. Main cement factories are present in Taxila, Gharibwal, Karachi, Hyderabad, Cherat and Sikandarabad.

23. How plants efficiency of taking up the fertilizers can be determined by the use of isotopes?

Ans: The radioisotopes are used for the determination of fertilizer uptake by the plants introducing a radioactive nutrient in the fertilizer and then detecting the radiations

emitted from different parts of the plant like leaves.

24. Give different steps involved in the extraction of sugar from sugarcane.

Ans: The extraction of sugar from sugarcane involves many steps like the extraction of juice from the raw sugarcane sticks, filtration of juice, vaporization, removal of impurities and finally the centrifugation.

25. Define ultrasound.

Ans: These are high frequency sound waves of above 20 KHz., produced by vibrating the quartz crystal to the required frequency. The sound of this much frequency is of very high energy.

26. How a coronary disease is detected using x-rays?

Ans: A radiopaque dye or constant medium is injected into the blood and then the coronary artery is examined through x-ray. The path of artery appears as dark spots due to the blockage caused by athero scierotic plaque. This gives an angiogram showing the blockage in the coronary artery along the upper surface of the heart.

27. What are the different uses of steel?

Ans: Steel is used for many purposes like the cutting of hard metals, structuring of automobiles and trains and its use as a construction material in bridges, buildings etc.

28. What is electrocardiography?

Ans: Electrocardiograph is the procedure through which the physicians obtain a graphical record of electrical activity of heart. It is abbreviated as ECG.

29. What is the mechanism of computerized tomography?

Ans: CT scan is used for the shooting of x-rays beam through the body to get a cross section of the body. This image is then reformed in the computer, which is present next to the body. The process is repeated at different intervals.

30. Why there is need to enhance the research in the field of pharmaceutical industry in Pakistan?

Ans: There is a dire need for research in this field for the development of medicines in our own country. This will save precious foreign exchange, create job opportunities for young scientists as well as general labour and reduce the prices of medicines.

31. What is the production of sugar in Pakistan?

Ans: Pakistan is producing about two million tons of sugar. This production is more than the need so extra amount of sugar is being exported for the earning of foreign exchange.

32. What is the situation of cotton industry in Pakistan?

Ans: In Pakistan it is the largest industry. It is one of the most important sectors of our economy. About 300 cotton textile mills are located in different cities mainly in Karachi, Faisalabad, Hyderabad and Multan.

33. Why synthetic fibre is becoming more popular in the world?

Ans: The synthetic fibre is becoming more popular in the world of textile because unlike natural fibre it can be made available in any required quantity, the manipulations in properties can be done by the manufacturers and above all the countries that previously used to spend huge amounts of foreign exchange on the export of natural fibre they can now get synthetic fibre at their own country.

34. What are the raw products used in the synthetic fibre industry?

Ans: The raw materials used in synthetic are mostly organic in nature. These are petroleum, coal, wool pulp etc.

35. What are different leather products made in Pakistan?

Ans: The main leather products being made in Pakistan are shoes, sandals, leather hand bags, caps, jackets etc.

Some of these are also being exported to the foreign countries.

36. How economic stability of a country is affected by different factors?

Ans: There are many factors of economic stability of a country like those related to politics, society, cultural activities, availability and utilization of natural resources, educational and training setup, the condition of industry etc.

36. How different rays are separated from the radiations emitted from a radioactive material?

Ans: The radioactive material is kept in a lead block. There is only one small opening in the block left so that a sharp beam is obtained. This sharp beam of radiations is then passed through the magnetic and electric fields in order to separate different rays and to study their properties.

a) Chose the most appropriate choice:

1. Steam engine was invented in_____ century.

a) seventeenth b) eighteenth
c) sixteenth d) nineteenth

2. Point out the odd one.

a) aircrafts b) ships
c) satellites d) rockets

3. First laser was formed in:

a) 1690 b) 1906
c) 1609 d) 1960

4. **The laser travels in ____ path.**
   a) straight b) dispersed
   c) curved d) circular

5. **Laser light consists of ______ colours.**
   a) 2 b) 7
   c) 3 d) non of these

6. **Ruby of crimson_____ colour.**
   a) blue b) green
   c) red d) white

7. **In medical laser is used to cure ______.**
   a) aids b) cancer
   c) hepatitis d) cholera

8. **The holography is used to get ____ dimension images.**
   a) two b) one
   c) four d) three

9. **Optical fibres are more_____ in transmission.**
   a) accurate b) fast
   c) non of these d) both of these

10. **Retina are attached to the walls of _____.**
   a) nose b) ears
   c) brain d) eyes

11. **Optical fibres are more _____.**
   a) thinner b) thicker
   c) broader d) longer

12. **Most of satellites complete their one revolution in _____ hours.**
   a) 42 b) 48
   c) 34 d) 24

13. **_____ waves are used in radar.**
   a) radio b) electromagnetic
   c) non of these d) both of these

14. **_____ can be determined using satellites.**
   a) typhoon b) weather
   c) hurricane d) all of these

15. **MIR is an example of_____ satellite.**
   a) military b) research
   c) telecommunication d) non of these

16. **The enemy's aircrafts are detected by using _____ technology.**
   a) tomograph b) laser
   c) CT Scan d) radar

17. **The cement production in Pakistan is____ tons.**
   a) 16000 b) 16600
   c) 10600 d) 61000

18. **Optical fibres are mainly used for:**
   a) research b) defence
   c) radioactivity d) transmission

19. **Steel mill in Pakistan is situated at:**
   a) Karachi b) Faisalabad
   c) Lahore d) Islamabad

20. **Steel mill in Pakistan was established with the coordination of:**
   a) Japan b) America
   c) China d) Russia

21. **Carbon-_____ is used for the determination of rock age.**
   a) 12 b) 22
   c) 21 d) 11

22. **_____ is used for the manufacture of synthetic fibre.**
   a) petroleum b) coal
   c) Wood pulp d) all of these

23. **Becquerel discovered in the radioactivity using_____.**
   a) thorium b) uranium
   c) cadmium d) hydrogen

24. **_____ block is used to limit the radioactive radiations.**
   a) iron b) silver
   c) lead d) copper

25. The elements having more than _____ atomic number are radioactive.
a) 80 b) 82
c) 88 d) 84

26. ____ rays are electromagnetic in nature.
a) beta b) alpha
c) radioactive d) gamma

27. Tritium has _____ number of neutrons in its nucleus.
a) 3 b) 1
c) 2 d) zero

28. Silver has two isotopes with atomic numbers 109 and ____.
a) 105 b) 110
c) 108 d) 107

29. ____ is an artificial radioactive element.
a) francium b) Berkelium
c) radium d) thorium

30. Cobalt-_____ is used in cancer treatment.
a) 70 b) 60
c) 20 d) 66

31. ____-32 is used for Leukaemia treatment.
a) phosphorous b) uranium
c) cobalt d) carbon

32. Carbon-12 is used for the study of ____ of rocks.
a) contents b) composition
c) ages d) size

33. The electrical activity of _____ is recorded by using electrocardiography.
a) liver b) brain
c) kidneys d) heart

34. Magnetic nuclear imaging is used in_____.
a) IMR b) RMI
c) RIM d) MRI

35. CT Scan is used to see the tissues of_____.
a) spine b) brain

c) pancreas d) heart

36. **Karachi Steel Mill was established in______.**
a) 1972 b) 1970
c) 1973 d) 1974

Answers:

1. b	10. d	19. a	28. d
2. b	11. a	20. d	29. b
3. d	12. d	21. a	30. b
4. a	13. d	22. d	31. a
5. d	14. d	23. b	32. c
6. c	15. b	24. c	33. d
7. b	16. d	25. b	34. d
8. d	17. a	26. d	35. b
9. b	18. d	27. c	36. c

Fill in the blanks and True or False questions are not included in the examination paper. However the same are being given for Memory Test of students.

a. *Fill in the blanks:*

1. In _____century internal combustion was invented.
2. The first laser was Ruby laser invented by _____.
3. Laser produces an _____ of light of very pure single colour.
4. Blindness may result as the _____ detaches from the walls of eyes.
5. Such photograph which gives a three dimensional image and shows a scene from different angles is called_____.
6. Data can be stored and read from special disks called_____.

7. Laser can be used to cut fabric of about ____ or more suits at a time.
8. Light can be made to travel along any type of curved path through thin glass rods called_____.
9. Light has frequency ____ times greater than the frequency of electric signals.
10. Most of satellites complete one revolution around the earth in much less than ____ hours.
11. Research satellites provide information about earth's magnetic field and ____ rays.
12. ____ and Skylab are examples of research satellites.
13. A ____ system consists of both transmitting as well as receiving system.
14. The ____ system consists of a radio frequency oscillator.
15. In most systems a single antenna is used for both _____ and reception.
16. Radar receiver is similar to a _____receiver.
17. In 1896, the French scientist _____ placed a sample of uranium salt near a photographic film in a pack.
18. It has been observed that atoms of same element may not have the same_____ weight.
19. Atoms of same elements having different mass numbers and same atomic numbers are called_____.
20. Hydrogen has ____ isotopes.
21. The nucleus of protium contains ____ protons.
22. Silver has two isotopes of mass numbers _____ and _____.
23. Tin has ____ isotopes.
24. Uranium has three isotopes having mass numbers _____,_____ and 238.
25. The elements heavier than lead are those which have atomic numbers greater than _____.
26. The element have atomic number greater than 82 are called_____.

27. Many artificial elements heavier than ____ have been produced in the laboratory.
28. A radio isotope is a _____ isotope of an element.
29. Radioactive Gallium ______ injected into blood stream of a patient.
30. Cobalt ____ is used in treating cancer of thyroid gland.
31. Phosphorous 32 is used in the treatment of _____.
32. X-rays are emitted from ____.
33. X-rays can pass through the _____ parts of our body.
34. Ultrasound employs high frequency sound waves above ____kHz.
35. Ultrasounds are produced by _____ crystal.
36. A flat or waveless _____ in a person in coma has been interpreted.
37. MRI produces high quality ____ images of inside of human body.
38. ACT Scan is a _____ x-rays.
39. CT Scan was first used to see _____ of brain.
40. Nearly _____% of population of Pakistan lives in towns and villages.
41. There are ____cement factories in our country.
42. Steel is an ____ of iron and carbon.
43. In Pakistan steel was built in ____.
44. The development of a nation is based on the development of ____ industry.
45. ____ is the Pakistan's largest industry.
46. In ____ Pakistan emerged as a powerful nuclear state on the map of the world.

Answers:

1.	nineteenth	24.	234, 235
2.	1960	25.	82
3.	intense beam	26.	radioactive
4.	retina	27.	natural

5.	holograph	28.	Uranium
6.	compact disks	29.	67
7.	fifty	30.	60
8.	glass fibres	31.	Leukaemia
9.	millions	32.	metallic
10.	24	33.	soft
11.	cosmic	34.	20
12.	MIR	35.	quartz
13.	radar	36.	EEG
14.	transmitting	37.	three dimensional
15.	transmission	38.	fancy
16.	radio	39.	tissues
17.	Henri Becquerel	40.	70
18.	atomic	41.	twenty five
19.	isotopes	42.	alloy
20.	three	43.	1973
21.	one	44.	steel
22.	107, 109	45.	textile
23.	ten	46.	1998

b) Indicate the True/ False Statements:

1. The Greek scientists are the pioneers of science and technology.
2. In the previous ages one scientist used to the master of many fields of science because they were more intelligent.
3. Mostly the advancements in science and technologies took place in the twentieth century.
4. Laser is light that consists of seven colours.
5. First laser was formed in which fossil fuels were used for their working.
6. Laser can be used for the drilling of hard metals.
7. Laser light has harmful effects on living body and cannot be used in medical.
8. In case of laser intense beam of light is produced.

9. Laser's best property is that when it is passed through the tumour (cancerous cells) it spreads and kills the effected body tissues.
10. The laser beam travels in a straight line and can be sent to moon.
11. The working of laser involves the excitation and de-excitation of atoms.
12. LASER stands for Light Amplification by Straight Emission of Radiations.
13. More data can be transmitted using modem cables instead of using glass fibres.
14. There is only one draw back in optic fibres that they stop functioning in case of electric disturbance.
15. Most of the satellites complete revolution around earth in one year.
16. For the monitoring of military activities surveillance satellites are used.
17. MIR and Skylab are the examples of research satellites.
18. Radar can be used to monitor the speed and direction of a reaching object.
19. Laser sometimes attacked to the fighter aircrafts at the time of war.
20. Two antennas, one for transmission and the other for receiving the signals are necessary in case of radar.
21. Nuclear radiations were discovered by Einstein in 1896.
22. The elements having less than 92 of atomic number are stable atoms.
23. The gamma radiations are electromagnetic in nature.
24. Two types of radiations are emitted from radioactive isotopes.
25. For artificial radioactivity man has produced the artificial radioactive isotopes in laboratories.
26. The isotopes of an element are its atoms that have same atomic number but different mass number.
27. Fermium is an artificial radioactive isotope.

Answers:

1. False	10. True	19. False
2. False	11. True	20. False
3. True	12. False	21. False
4. False	13. False	22. False
5. False	14. False	23. True
6. True	15. False	24. False
7. False	16. True	25. True
8. True	17. True	26. False
9. False	18. True	27. True

c. Identify and label the following figures:

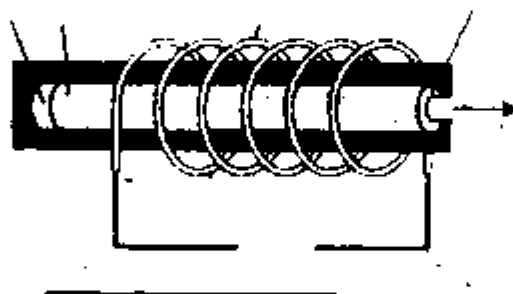
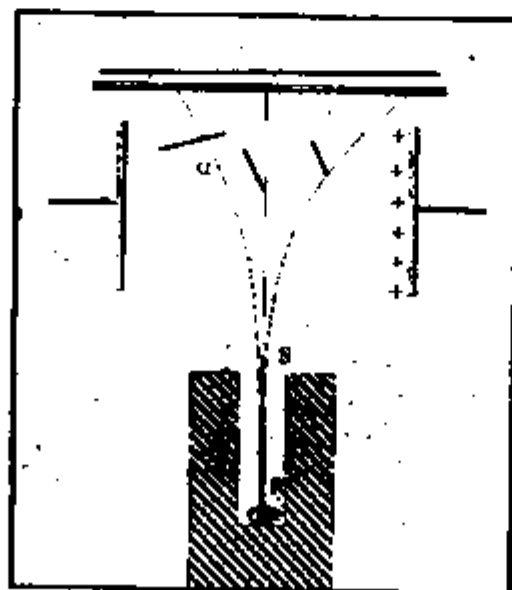



Figure 1

Figure 2

Pakistan's Space and Nuclear Programme

Section-I

Introduction to Chapter

Contents: This chapter deals with the following topics.

- History of Space Exploration.
- Rockets, Their Types and Functions.
- Apollo's Mission.
- Satellites, Types and Functions.
- Space Shuttle and Its Importance.
- Space Program of Pakistan.
- Use of Nuclear Energy in Different Fields in Pakistan.

Concepts:

- **What is the need to develop in space exploration?**

There is a dire need by Pakistan to develop in the space technology. This is because it is the age of telecommunication and the nations which have better and frequent interaction with the world are able to explain their ideas more clearly. The multimedia of this age is developed on satellites technology and the messages are being transmitted to all over the world. So if a county has its own telecommunication satellites they have a platform for making their views clear to the world. We can also get latest information through the use of satellites from all around the world.

This technology has also military importance. The movement of military troops can be monitored by using these satellites.

Section-II

Comprehensive Questions with Answers

1. Write a note on the history of space exploration.

Ans: **Space exploration:** The development of rockets has made it possible for humans to travel in space. Now man has managed to travel through long distances in the space which he could not even imagine in the past.

History of Space Exploration:

Rocket Invention: German scientists made first rocket during World War-II.

First Success: Sputnik I was the first artificial satellite sent in space by a powerful rocket in 1957 by Russian scientists. After that Americans sent their satellite in space which was again followed by Russians. Since then many satellites like Apollo space aircrafts have been developed and sent in space.

Historical Events: Some of the historical events related to space are:

a) It was a Russian cosmonaut who orbited the earth for the first time in an artificial satellite.

b) Two American persons walked on the surface of moon for the first time in July 20, 1969.

Features Related to Space Exploration:

Discoveries About The Nature of Planets: Much efforts have been in the last few years to discover the facts about the planets that revolve around the sun like Mars and Venus. To fulfill the purpose many space stations have been established which are used to obtain the pictures and photographs of space from different sites.

Rockets and Space Conquer: The development of space ships, rockets has made it possible to discover and conquer

the space. Man is now trying to get so much information about the other planets as he has about earth.

Discoveries: Using artificial satellites magnetic sphere and Van Allen belts were discovered in 1957 and 1958. Therefore these years are called geophysical years.

Earth Surveys: The satellites have also been used for the aerial surveys of earth. These surveys are carried out to collect information about the land resources like minerals, oil, coal, and water resources buried under the soil surface.

Telecommunication: The satellites are also being used in the telecommunication. First television relay station was Telstar. It was revolving around the earth at an altitude of 925 km to 5600 km. It completed one revolution around earth in two and half an hour. The world has been turned into a global village by the worldwide broadcasting and Internet facilities.

Information About Stars: Stars are different from the planets because of nuclear fusion reactions going on in them producing large amounts of energy. This makes these objects shining. Such information about stars are also being collected.

Space Stations: The idea of space stations was given by a Russian scientist. These space stations are used a supply depot for the rockets going far into the space. They are also used to carry out the experiments such experiments which are not possible on earth by developing the research laboratories there.

Space Station Activities: The space stations are being used to carry out experiments related to the fields of physics, chemistry, biology etc.

MIR: It was the first largest space station which was sent by Russia in space.

SKYLAB: It is the research space station sent by America in space.

2. **What principle is involved in the rockets? Give details of the Saturn rocket and Apollo aircrafts with reference to Apollo mission.**

Ans: The rockets are one of very important scientific

discoveries of this age. These rockets have very significant role in space research.

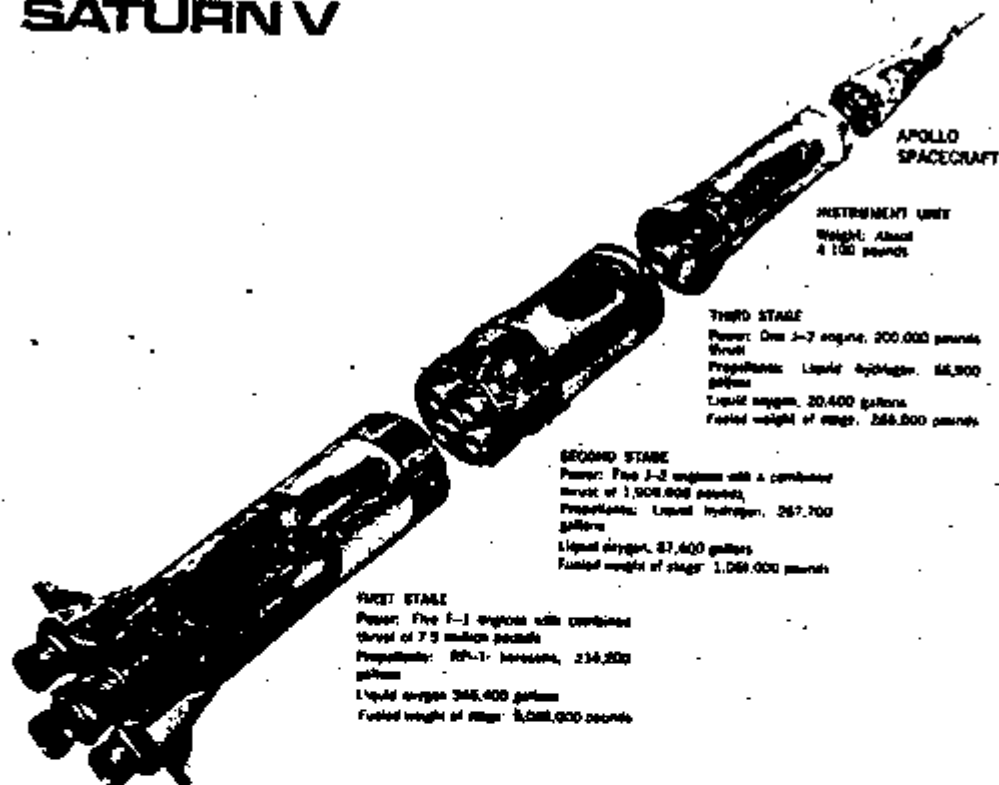
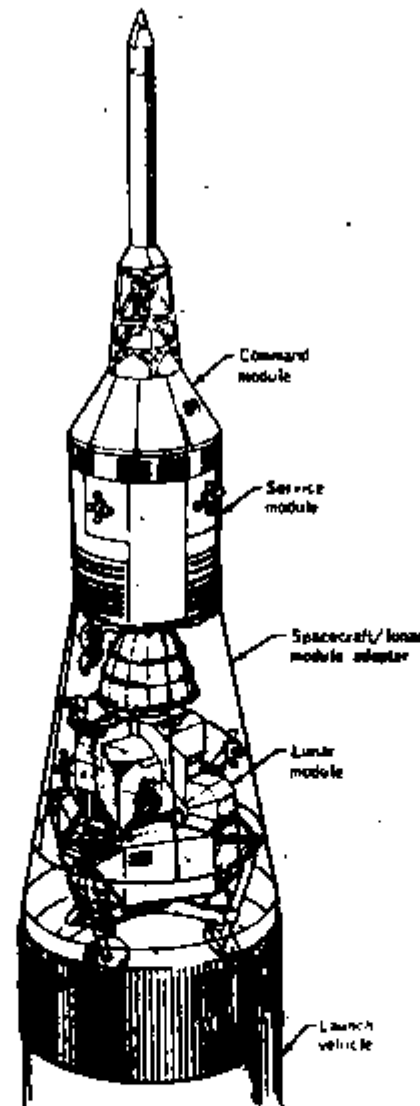



Diagram of Saturn Rocket

Working Principle: All the rockets obey and function on the Newton's third law of motion. "It states that there is always a reaction for every action whose magnitude is equal to that of action and direction is opposite to it".

Phenomena: The oxygen and liquid fuel are mixed together and allowed to burn in the combustion chamber. It results in the release of hot and expanding gases that thrush the combustion chamber out. This causes the movement of rocket in the opposite direction as a reaction.

Multistage Rockets: If the rocket is to be carried to long distances in space, then multistage rockets are used.

APOLLO LAUNCH CONFIGURATION FOR LUNAR LANDING MISSION

Apollo spacecraft

Saturn:

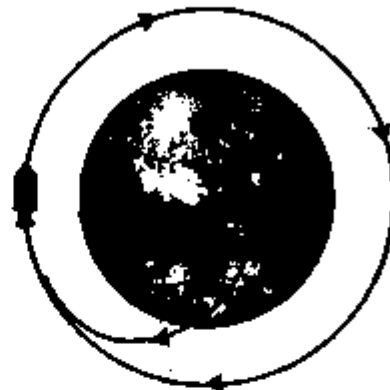
It is a multistage rocket that consists of various stages.

First Stage: It is preset at the bottom of the rocket with its fuel and oxygen. On blasting off it lifts the rocket high into the atmosphere. As soon as its fuel and oxygen expires it drops away and separated from rest of the rocket body.

Second Stage: The combustion of second stage fuel and oxygen carries the rocket further away because now it has become lighter in weight due to the separation of first stage.

When all of its fuel is used up it also separates from the rest of the body making rocket more lighter.

Third Stage: The third stage carries the payload instruments, other instruments or men into the space.

Lunar module landed on the moon

Lunar module rejoin the Apollo Spacecraft

Completing the mission Apollo spacecraft returning to earth leaving behind the lunar module orbiting around the moon

Payload: It might be a man made satellite for revolving around the earth or it might be a probe carrying instruments used for the exploring of space. It may also be a spacecraft carrying some scientists in order to carry out research in space.

Apollo Mission:

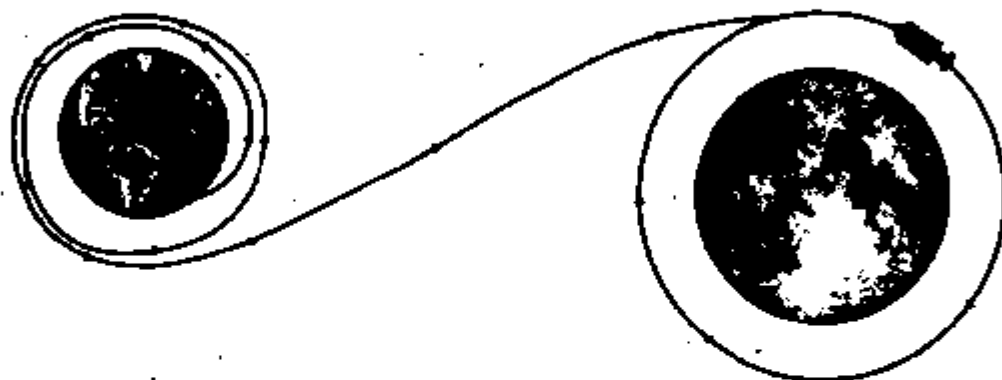
Apollo aircraft is present at the top of giant Saturn rocket as payload.

Design of Apollo aircraft: It consists of following components:

i. **Command Module:** It can support three astronauts.

ii. **Service Module:** It is used to supply thrust, electrical power and reserve oxygen.

iii. **Lunar Module:** It is present for the landing on moon's surface.

Reaching Moon's Surface: The Apollo aircraft carried by the Saturn rocket reached near moon and separated from the rocket. Now it started orbiting around the moon at a height of about 100 km from the moon's surface.

Apollo spacecraft orbiting around the moon

Lifting of Astronauts: The astronauts now entered the lunar module leaving the moon's surface. The lunar module separated from the rest aircraft and left at the moon along with astronauts. The spacecraft started to return to the earth.

3. **What are requirements and uses sending a satellite in space?**

Ans: ***Satellites:***

Satellites are the small objects that are sent in the space with the help of rockets and made to revolve around the earth.

Requirement: For the revolution of satellites around earth they must be able to travel at a speed of 8 km per second.

Different Satellites and Their Uses:

Many artificial satellites have been designed for different

purposes. They first collect the data and then send it back to the earth by radio transmitters.

The first artificial satellite Sputnik-I was put into orbit around the earth on October 4, 1957 by Russian Scientists

Information About Space: There some satellites which are designed in such a way that their optical and other sensing instruments gather the information about magnetic field, radiation from the sun and space, photographs of space and planets etc. and then communicate back to the earth.

Meteorological Satellites: These are the satellites that collect the information about the weather conditions in the form of video pictures of clouds and sent to earth. This information is then used for the prediction of weather conditions.

Communication Satellites: The radio communication is also a practical application of the satellites. These satellites may be present in the low orbits. They increase the strength of the signals during re-broadcasting to the earth that they receive from the earth.

Hovering Satellites: These are the communication satellites whose functioning depends upon following conditions.

a) These satellites must remain at a specific site with respect to earth's station so that the radio waves can be sent and received from the satellite from the ground station by focusing the dish antenna towards them.

b) For maintaining a specific site these satellites must revolve with a high speed and complete one revolution

around earth in 24 hours. By this these satellites appear to be stationary with the ground station.

c) The usual height of these satellites from earth surface is 35900 km.

Geostationary Orbits: The orbits of the hovering satellites are called geostationary orbits.

Communication Procedure: There are many types of such hovering satellites that maintain a suitable position with respect to earth's station. The signals are transmitted by the "line of sight" from earth to any one of the hovering satellites, relayed between satellites and then sent back to earth. These satellites can relay more than one television station at a time at very high frequency.

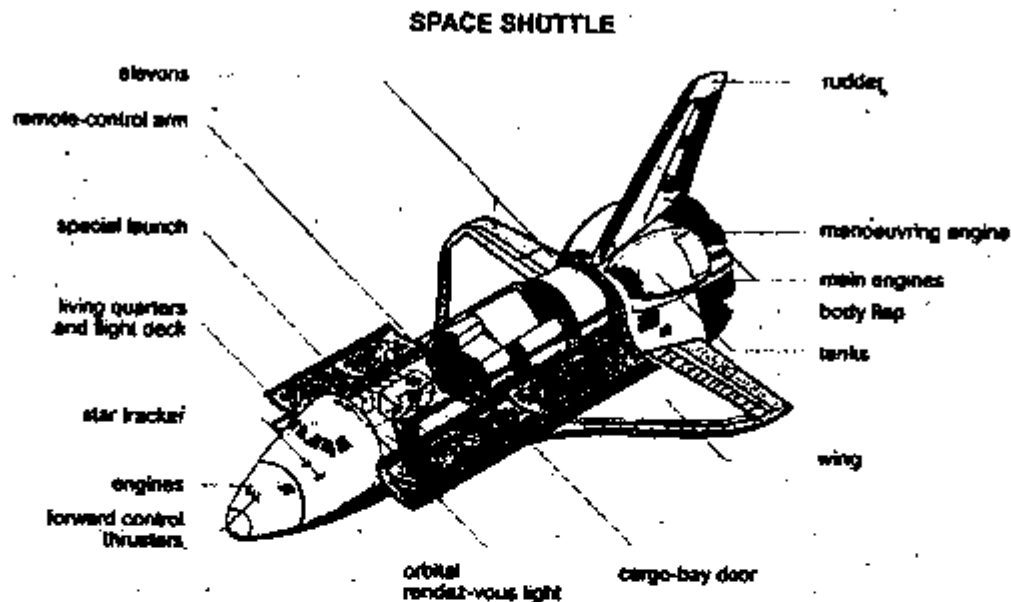
Power of Satellites: Solar batteries are used to provide power to the electronic circuits of these satellites.

4. What is a space shuttle? Discuss its uses and structure.

Ans: ***Space Shuttle:***

"It is a space craft which is formed for the transportation of humans and cargo between Earth and the orbit around Earth.

Space shuttle discovery ready for its mission

History of Space Shuttle: The first space shuttle designed by man in 1970s. It served as reusable rocket and spacecraft. Columbia was the first shuttle which was launched into the space on 12th April, 1981.

Various sections of a Space Shuttle

Uses of Space Shuttle: A space shuttle is designed to perform a number of tasks especially to carry payload i.e. the equipments which are carried to the space. Some of the uses of space shuttle are:

a) It can carry satellites, spacecrafts etc. to and from the orbits around earth.

b) It can also carry the scientific laboratories for modular Spacelab system.

c) It is the workstation for the astronauts repairing the satellites.

d) It is used to bring non-operational satellites from space back to earth.

e) It may also be used for carry out military operations.

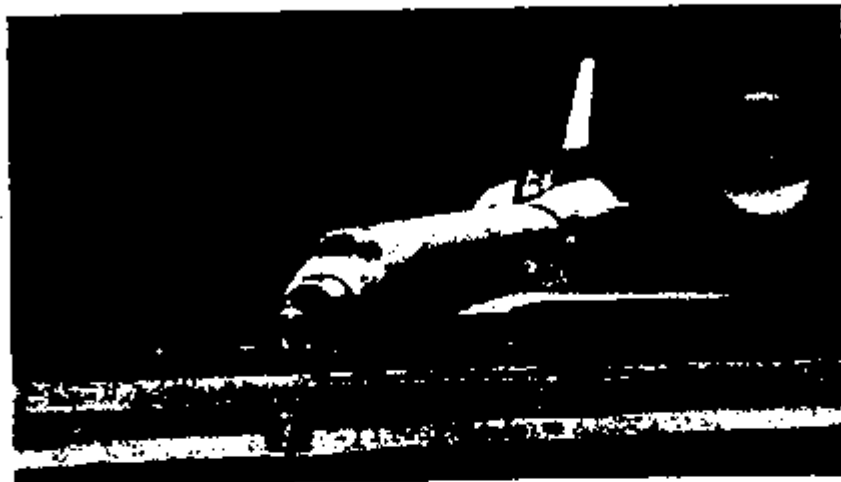
Space Transportation System: It is the space shuttle system which is the most technical, advanced and complex machine system in the world. It consists of following parts:

a) Orbiter

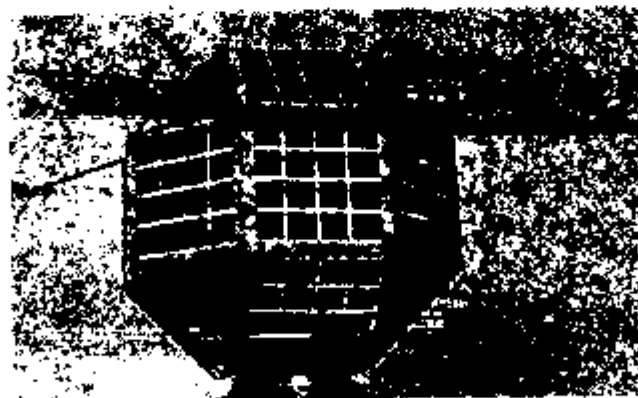
b) Propulsion system

c) Two solid rocket boosters (SRBs)

d) Three main engines

e) External fuel tank

Landing of Space Shuttle

5. Write a detailed note on Pakistan's space program.

Ans: Pakistan also has the organizational set up for space research and exploration. An independent commission called SUPARCO is carrying out research in this field.

A satellite

SUPARCO: It stands for Space and Upper Atmosphere Research Commission.

Facilities and Achievements:

a) Research and testing facilities are available at Sonmiani near Karachi.

b) This commission has fired several rocket for the weather research.
c) It has many communication satellite plants for the communication all over Pakistan throughout the 24 hours.
d) Badar-I which was the first satellite of Pakistan sent in space in July, 1990. It was a result of its efforts.

Space and Atmospheric Research Canter (SPARCENT): It is the main scientific research canter of SPARCO which is situated at Karachi. It has following divisions.

a) **Remote Sensing and Applications (RSA) Division:** Its work is based on following research areas:
   i) Dissemination of satellite remote system (SRS) data products.
   ii) Research and demonstration studies based on remote sensing data and Geographic Information System (GIS) technology to environmental monitoring, mapping and earth resource surveying.
b) **Environmental and Space Science (E&SS) Division:** It is related to the research and application projects related to space and atmospheric sciences. Its specific fields are: Satellite technology, meteorology, satellite radiance, atmospheric pollution, geodesy and astronomy.
c) **Ionosphere Research (IR) Division:** It is concerned with the studies of ionosphere. These studies include:
   i) The behaviour of ionosphere.
   ii) Effects of ionosphere on radio wave propagation.
   iii) The studies related to geomagnetism.
d) **Satellite Communication (SC) Division:** It performs following duties:
   i) Planning and implementation of projects related to low orbit and geostationary satellites.
   ii) Establishment and operation of ground stations for telemetry, telecommand and reception of data from satellites.

Aerospace Institute: It is a sub institute of SUPARCO located on the SGS campus near Islamabad. It started its work in 1998. Its function is to produce trained and qualified manpower in different fields of space science and technology.

6. **Discuss in detail the nuclear program of Pakistan. Also give its objectives and application in different fields.**

Ans: **Pakistan's Nuclear Program:** Pakistan started its nuclear program during 1950s when Pakistan Atomic Energy Commission on the program was established.

Pakistan Atomic Energy Commission (PAEC): Pakistan Atomic Energy Commission was established in 1955. Its headquarter is situated at Islamabad. Atomic Energy Council laid down the broad guidelines, which are then followed by the commission.

Aim of Atomic Energy: Its aim is to use the atomic energy for the development, prosperity of humanity. It is playing a vital role in the Pakistan's economy.

Objectives of PAEC: PAEC has three objectives i.e.

i. **Economic Development:** Using nuclear power for the economic development.
ii. **Support to Program:** Using nuclear technology to support the nuclear program.
iii. **Application For Peaceful Use:** The application of nuclear technology for peaceful purposes in health, agriculture and biological sciences.

Areas of Peaceful Research: There are many research areas and projects which have been started for the use of nuclear technology in different scientific fields. These are

Nuclear Technology:

Pakistan has taken many steps for the development in this technology.

Establishment of PINSTECH: PINSTECH is the abbreviation of Pakistan Institute of Nuclear Science and Technology. It is situated in Islamabad.

Facilities and Achievements:

a). The institution from the day of its establishment is doing research and development in the field of nuclear technology.
b) It has been developed into a research laboratory of international standard.
c) It is providing excellent facilities for research in different fields like nuclear physics, nuclear engineering, chemistry, materials, electronics and

production and application of isotopes.

d) The supply of radioisotopes by the institute started in 1967.
e) The institute is doing mass production of radioactive isotopes for the use in the commission's laboratories and radioisotope medical centres.

Nuclear Power Generation:

There are many sources from where we are fulfilling the energy requirements of our country. These are:

Natural Gas: There are vast resources of natural gas. Its better use is its consumption for the manufacture of fertilizer as a raw material and it's burning for power production. In this process 70% of the energy is lost as heat.

Hydroelectric Power Plants: It is the very important source of energy in Pakistan. It has been estimated that if Mangla, Tarbela and other dams are extended we can get about 2000 MW of more electricity. Kalabagh and Kohala are the new dams which are planed to be built. The capacity of these dams will be 2000-3000 MW.

- **Need For Nuclear Energy:** Our efforts are to make full use of all the power generation sources like hydro, coal, petroleum, natural gas etc. but still we are short of energy production as compared to its consumption. So we fulfill the additional requirements from the nuclear energy. There is a need to build a number of nuclear power plants to fulfill our domestic energy requirements.

Nuclear Power Plants: Two nuclear power plants are working at Karachi and Chashma.

i. **Karachi Nuclear Power Plant (KANUPP):**
It was established in 1972. Its annual production of electricity is 137 MW. The uranium is used as a fuel. The supply of uranium is purely based on local resources. The supply, reprocessing and fabrication of uranium and the management of the plant is purely controlled by Pakistani scientists and engineers.
ii. **Chashma Nuclear Power Plant:** It started functioning in 1998. It is situated at the right bank of

Chashma canal of the River Indus. The electricity production capacity of this plant is 300 MW.

Agricultural Centres:

There are many problems in agriculture which are successfully being solved by the nuclear technology.

Problems and Solution:

a) One of the main problems in agriculture is the low production of crops. Yield per acre of Pakistan is 3 to 4 times lower than that of other countries. Research is being done to use the nuclear radiations for the evolution of new improved and highly productive varieties of crops.
b) Another big problem in this sector is the loss of produce due to pests. These are also being managed by radiations.
c) One-sixth of our production is lost after harvesting due to insufficient and unsatisfactory storage facilities. This causes loss of millions of rupees every year. Research is also being done to solve this problem.

Establishment of Institutes: In order to solve problems related to agriculture Pakistan Atomic Energy Commission has established three agriculture based nuclear research centres at different sites in Pakistan. These are present at:

a) Faisalabad
b) Tandojam
c) Tarnab, Peshawar.

Nuclear Medical Centres:

These centres are established at Karachi, Lahore, Multan, Jamshooro, Larkana, Peshawar, Islamabad and Quetta.

Purpose: These centres are established mainly for the following purposes.

a) Diagnosis of several unconventional diseases.
b) Treatment of many diseases by the use of radioisotopes.

Facilities: These centres provide many facilities related to medical to the local people. The poor patients are provided with free treatment at the nuclear medical centres. It is providing medical facilities to thousands of patients. The percentage of patients is further increasing at these nuclear medical centres. This is because the conventional non-curable

diseases are also being treated here.

Industrial Development:

The application of nuclear energy is very vast. It has not only helped us in scientific research but has also added to the industry. A separate division is working on these aspects.

Radiations and Isotopes Application Division: It is helping in the development of high quality testing methods. The main purpose of this type of research is to maintain a quality control so that a specific standard of the industrial products is maintained.

Industrial Development and Nuclear Technology: The applications of nuclear technology have greatly helped for the industrial development by:

a) Improving the standards of scientific research.
b) Developing high quality manpower.
c) Improving the level of education and training.
d) Building up scientific infrastructure.

Solved Exercises of Text Book

1. Complete the following statements:

i. The first man landed on moon in the year ________.

ii. The idea of space station was first given by ________ scientist.

iii. Apollo spacecraft went into orbit around moon at the height of about ________.

iv. Space shuttle is a spacecraft for transporting humans and cargo between earth and the orbit around ________.

v. SUPARCO stands for ________.

Answers:

i)	1969
ii)	Russian
iii)	100 km
iv)	earth
v	Upper Atmosphere Research Commission

2. Tick (✓) the following statements either True or False:

i)	Multistage rockets were developed to go into space.	False
ii)	Communication satellites are also called as hovering satellites.	True
iii)	Space shuttle challenges was destroyed in 1986.	False
iv)	PINSTECH first reactor was a 5 MW pool type research reactor.	True
v)	Pakistan has five medicine centres working in the county.	False

3. Encircle one choice a, b, c or d in each case:

i) Sputnik was sent into space by:
a) Russia
b) America
c) China
d) France

ii) A rocket which is used for space exploration consists of:
a) 5 stages
b) 2 stages
c) 3 stages
d) 4 stages

iii) Space shuttle carries between:
a) earth and moon
b)earth and other planets
c) earth and orbit around earth
d) earth to space

iv) Pakistan's first satellites Bed or I was sent into space in:
a) 1980
b) 1985
c) 1990
d) 1995

v) The power of nuclear power plant commissioned at the eight bank of Chashma Canal is:
a) 100 Mega watt
b) 200 Mega watt
c) 250 Mega watt
d) 300 Mega watt

4. What do you understand by space exploration?

Ans: See Q. No. 1 for answer.

5. How rocket works in space?

Ans: **Working Principle:** All the rockets obey and function on the Newton's third law of motion. "It states that there is always a reaction for every action whose magnitude is equal to that of action and direction is opposite to it".

Phenomena: The oxygen and liquid fuel are mixed together and allowed to burn in the combustion chamber. It results in the release of hot and expanding gases that thrush the combustion chamber out. This causes the movement of rocket in the opposite direction as a reaction.

6. Describe the APOLLO II mission.

Ans: See Q. No. 2 for answer.

7. What is a satellite? Name different types of satellites.

Ans: See Q. No. 3 for answer.

8. What is the purpose of a space shuttle?

Ans:

a) A space shuttle is designed to perform a number of tasks especially to carry payload i.e. the equipments which are carried to the space. Some of the uses of space shuttle are:

b) It can carry satellites, spacecrafts etc. to and from the orbits around earth.

c) It can also carry the scientific laboratories for modular Spacelab system.

d) It is the workstation for the astronauts repairing the satellites.

e) It is used to bring non-operational satellites from space back to earth.

f) It may also be used for carry out military operations.

9. Mention some of the achievements of Pakistan in space research.

Ans: Pakistan has benefited his nation with the fruits of atomic energy in different fields. For detail see Q. No. 6.

10. What do you understand by the nuclear program of Pakistan?

Ans: Pakistan nuclear program is to aimed to produce power for the peaceful use. It objectives are:

a) To produce electricity for nation.

b) To reduce poverty

c) To give maximum benefits to nation.

d) To use nuclear power for the production of food and its preservation etc.

e) To establish peace in the world

Section-III

Short Questions with Answers

1. What was the first satellite sent in space?

Ans: Sputnik I was the first artificial satellite sent in space by a powerful rocket in 1957 by Russian scientists. This was a great success in the history of space exploration because it stimulated the scientists of other countries towards this field.

2. What is the importance of rockets in space exploration?

Ans: After the discoveries, theoretical knowledge and establishment of equipments it was important to carry the materials into the space. The development of space ships, rockets solved this problem and made it possible to discover and conquer the space.

3. What is the importance of satellites in earth surveys?

Ans: The satellites have also been used for the aerial surveys of earth. These surveys are carried out to collect information about the land resources like minerals, oil, coal, and water resources buried under the soil surface.

4. Why space stations are important in space?

Ans: The space stations are used a supply depot for the rockets going far into the space and to carry out the experiments such experiments which are not possible on earth by developing the research laboratories in space.

5. What type of research is being carried out at space stations?

Ans: Main function of space stations is to do research. They are being used to carry out experiments related to the fields of physics, chemistry, biology etc.

6. What is the working principle in rockets?

Ans: The rockets work on the Newton's third law of motion, which states that there is always a reaction for every action whose magnitude, is equal to that of action and direction is opposite to it.

7. How rockets are pushed to the atmosphere and then into the space?

Ans: The oxygen and liquid fuel are allowed to burn in the combustion chamber. It results in the release of hot and expanding gases that thrush the combustion chamber out. This causes the movement of rocket in the opposite direction as a reaction and pushes it into the atmosphere and space.

8. What was the design of Apollo's aircraft?

Ans: Design of Apollo aircraft consists of following components i.e. Command Module that could support three astronauts, a Service Module to supply thrust, electrical power and reserve oxygen and a Lunar Module for the landing on moon's surface.

9. What is payload?

Ans: It is the actual structure that is to be carried into the space by the rocket. It might be a man made satellite for revolving around the earth it might be a probe carrying instruments used for the exploring of space. It may also be a spacecraft carrying some scientists in order to carry out research in space.

10. What are the requirements for the functioning of hovering satellites?

Ans: These satellites must remain at a specific cite with respect to earth's station so that the radio waves can be sent and received from the satellite from the ground station by focusing the dish antenna towards them, they must complete one revolution around earth in 24 hours and they must maintain a height of 35900 km from the earth's surface.

11. What is the source of power of satellites?

Ans: Solar energy is used for the provision of power to satellites. For this purpose different circuits of solar cells are present in the satellite.

12. How the television programs are broadcasted using hovering satellites?

Ans: The signals of television programs consisting of sound and pictures are transmitted by the "line of sight" from earth to any one of the hovering satellites, relayed between satellites and then sent back to earth where our television receiving system receives these signals.

13. When space shuttle was made and sent to space?

Ans: The first space shuttle designed by man in 1970s. It served as reusable rocket and spacecraft. Columbia was the first shuttle which was launched into the space on 12th April, 1981.

14. What is the structure of space transportation system?

Ans: It is the system present in space shuttle. It consists of

orbite, propulsion system, two solid rocket boosters (SRBs), three main engines and external fuel tank.

15. What is the research area of RSA Division of SPARCENT?

Ans: The research being carried out at RSA Division of SPARCENT is dissemination of satellite remote system (SRS) data products and research and demonstration studies based on remote sensing data and Geographic Information System (GIS) technology to environmental monitoring, mapping and earth resource surveying.

16. What activities are being carried out at IR Division of SPARCENT?

Ans: This division deals with the studies related to the behaviour of ionosphere, effects of ionosphere on radio wave propagation and the studies related to geomagnetism.

17. What are the objectives of Pakistan Atomic Energy Commission?

Ans: The objectives of Pakistan Atomic Energy Commission are to use the nuclear power for the economic development of the country, to apply nuclear energy for the support of nuclear program and to use the nuclear technology for the peaceful use like in medical or agriculture etc.

18. Where nuclear medical centres are located?

Ans: The nuclear medical centres are located throughout Pakistan. These are located at Karachi, Lahore, Multan, Jamshooro, Larkana, Peshawar, Islamabad and Quetta.

19. What is the purpose of nuclear medical centres?

Ans: The purpose of nuclear medical centres is to diagnose several unconventional diseases and treatment of many diseases by the use of radioisotopes.

20 What is the main problem in agriculture with reference to conventional crop varieties?

Ans: The main problem in agriculture is the low production of crop conventional varieties being grown by farmers from years ago. As a result of continuous use of these non-productive varieties yield per acre of Pakistan is 3 to 4 times lower than that of other countries.

21. What are the storage problems of agricultural produce?

Ans: We loss about one-sixth part of our agricultural produce after harvesting. This is because of poor storage conditions, threshing losses and attack of diseases and insect pests on stored products.

a) Chose the most appropriate choice:

1. The mission of PAEC is:
a) elimination of poverty
b) development of humanity
c) rising of living standards
d) all of above

2. Karachi Nuclear Plant is producing____ megawatts of electricity.
a) 127 b) 134
c) 137 d) 123

3. KANUPP was established in:
a) 1982 b) 1957
c) 1998 d) 1972

4. Extension of Mangla and Tarbela will produce ____ MW of extra energy.
a) 1500 b) 2000
c) 400 d) 200

5. **Chashma power plant started working in:**
a) 1998 b) 1982
c) 1992 d) 1976

6. **Pakistan has ______ sources of natural gas.**
a) no b) limited
c) fewer d) rich

7. **The PINSTECH is situated at:**
a) Lahore b) Rawalpindi
c) Karachi d) Islamabad

8. **The PAEC was established in:**
a) 1955 b) 1956
c) 1966 d) 1965

9. **_____ deals with atmospheric science.**
a) IR b) RSA
c) SC d) E&SS

10. **Badar I was launched in:**
a) 1980 b) 1990
c) 1970 d) 1909

11. **SUPARCO is situated at :**
a) Lahore b) Sialkot
c) Karachi d) Islamabad

12. **The space-shuttle system is also called as:**
a) STS b) TTS
c) SST d) STSS

13. **The first space shuttle was:**
a) Apollo b) Columbia
c) MIR d) Space lab

14. **First space shuttle was developed in:**
a) 1980s b) 1970s
c) 1990s d) 1960s

15. **The satellites are of______ types.**
a) 3 b) 4
c) 2 d) many

16. Space labs are concerned with the experiments on:
a) biology b) chemistry
c) physics d) all of above

17. The international geographical year is:
a) 1958 b) 1985
c) 1968 d) 1986

18. The Saturn is:
a) rocket b) plane
c) aircraft d) space shuttle

19. An aircraft placed at the top of a rocket is called:
a) payload b) shuttle
c) carrier d) spacecraft

20. The Apollo aircraft had ______ components.
a) 10 b) 3
c) 6 d) 2

21. MIR was sent in space by:
a) Germany b) China
c) America d) Russia

Answers:

1.	d	7.	a	15.	d
2.	c	8.	d	16.	d
3.	d	9.	b	17.	a
4.	b	10.	c	18.	a
5.	a	11.	a	19.	a
6.	d	12.	b	20.	b
7.	d	13.	b	21.	d

Fill in the blanks and True or False questions are not included in the examination paper. However the same are being given for Memory Test of students.

a. *Fill in the blanks:*

1. Rockets were first made by Germans during the world war____.
2. In ____ first man walked on moon surface.
3. First T.V relay station was Telstar orbiting at an altitude of ____km to____ km.
4. A rocket works on _____ law of action and reaction.
5. The rocket engine at bottom with its fuel and oxygen is called ____ stage.
6. Artificial satellites must have a speed almost _____ km/s.
7. A _____ scientist was the first to put forward the idea of permanent space station.
8. The TV relay station was ______.
9. The development of rockets and space ships had made it possible to _____ space.
10. The first space shuttle_____ was launched on 12th April 1981.
11. The space shuttle system is called _____ system.
12. The space shuttle system have ____ main engines.
13. Pakistan has established an organization for space research, named _____.
14. The satellites revolving around the earth are called______.
15. The satellites revolve around the earth at a height of about ___km above the earth's surface.
16. SUPARCO's main centre for scientific research is called______.
17. Pakistan Atomic Energy Commission was established in ______.
18. The headquarter of PAEC is at _______.

19. The PINSTECH started supply of radioactive isotopes in ______.
20. Hydroelectric power is an important ____ in the county.
21. Karachi Nuclear Power Plant is capable of producing _____ megawatts of electricity.
22. Karachi Nuclear Power Plant was established in______.

Answers:

1.	II	12.	three
2.	July 20, 1969	13.	SUPARCO
3.	925, 5600	14.	hovering
4.	Newton's	15.	35900
5.	first	16.	space and atmosphere
6.	8	17.	1955
7.	Russian	18.	Islamabad
8.	Telstar	19.	1961
9.	conquer	20.	resources
10.	Columbia	21.	137
11.	space	22.	192

b) Indicate the True/ False Statements:

1. The Germans made first rocket.
2. First rocket was made during first world war.
3. Sputnik I was sent in space in 1967.
4. The first men walking on the surface of moon were Americans.
5. In July 20, 1969 man walked on the surface of moon.
6. Apollo II was a great fighter aircraft of its age.
7. Mars and Venus are the planets.
8. First TV station was Starvision.
9. Van Allen belts are situated in America.
10. Telstar is the first relay station.
11. Telstar orbited for four and half an hour.

12. The first TV relay station attained a maximum height of 5600 km.
13. Skylab was sent by Russia.
14. Fuel is burnt with hydrogen in a rocket.
15. The rocket works on the principle of Newton.
16. Saturn was a multistage rocket.
17. Apollo spacecraft orbited around moon at a height of 1000 km.
18. Satellites must have a minimum speed of 18 km/s.
19. The communication satellites must complete their revolution around earth in 24 hour.
20. First space shuttle was developed in 1970s.

Answers:

1. True	8. False	15. True
2. False	9. False	16. True
3. False	10. True	17. False
4. True	11. False	18. False
5. True	12. True	19. True
6. False	13. False	20. True
7. True	14. False	

c. Identify and label the following figures:

Figure 1

Figure 2